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THE OIL WEEKLY

OIL & GAS ENGINEERING

News Statistics

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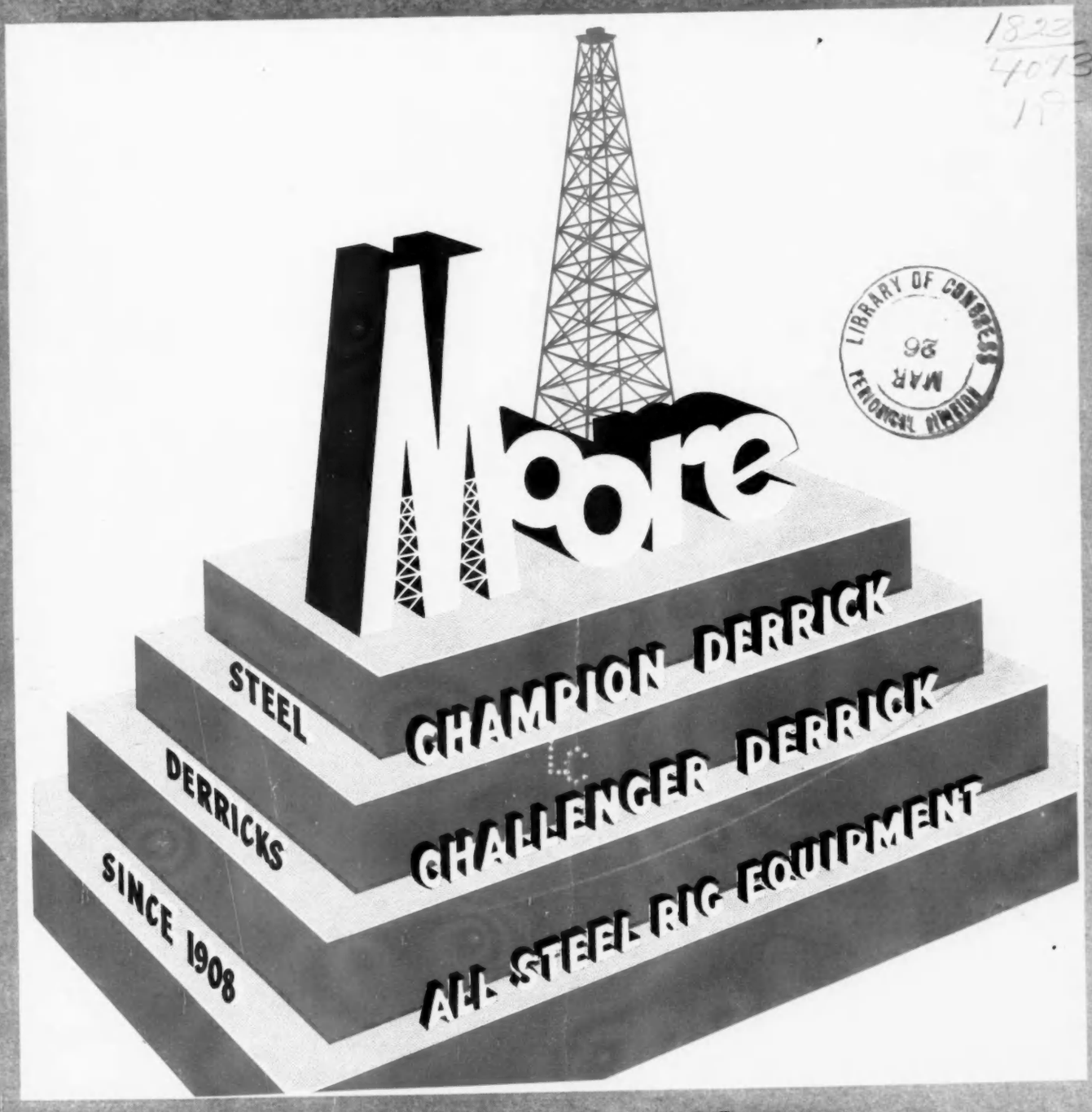

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MAR 26
PERIODICAL ROOM

March 18, 1932

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These operators would have saved many dollars by guarding against vertical deviation

TN860
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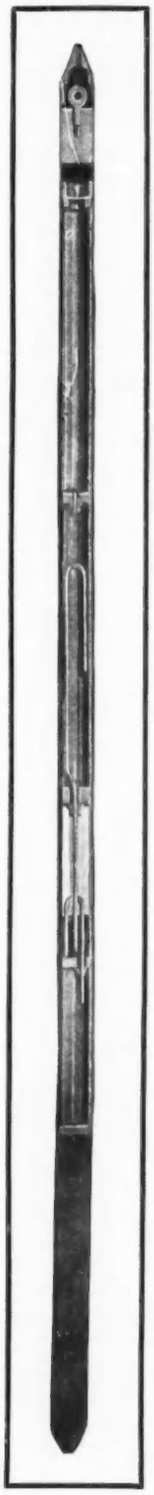

1 **Example No. 1**—This drilling operation was surrounded by producing wells, but at the expected depth, that is, approximately 5,000 feet, the producing sand was not found. A survey was made which showed the well from 1,000 feet down to be badly off the vertical and having a maximum angle of 19°. The well was plugged back to less than 800 feet and redrilled. This was extremely expensive, as over 4,000 feet of hole cased with 10" casing was lost and none of the casing salvaged. When the well was started again, a SYFO CLINOGRAPH of the Go-Devil type was used constantly and the well kept within a small degree of vertical. At the expected depth, the sand was found and a good well resulted. This case shows the difference between a dry hole and a producing well, through not checking verticality, including the loss of 4,000 feet of 10" casing.

2 **Example No. 2**—A well drilled in the Texas field was surveyed with a SYFO CLINOGRAPH and the results found were as follows: at 500 feet, straight —at 1,000 feet, straight—at 1325 feet, 5° off vertical—at 2546 feet, 11° off vertical. After 48 hours of reaming, no improvement was noticed so the well was cemented back and redrilled. This resulted in the loss of 1,500 feet of hole and the labor and material consumed in forty eight hours of reaming. The loss more than took away any profit the drilling contractor hoped to make on this well, as contracts in the East Texas field are rather low priced and if a contractor has any loss at all, it more than eats up his anticipated profit.

3 **Example No. 3**—A well known producing company in the Humble field made only a 200 barrel well when surrounded by wells good for from 800 to 1,000 barrels. A SYFO CLINOGRAPH survey was made and the well was found to be about 21° off the vertical at about 4,500 feet. As the well was completed, no attempt was made to straighten it up. The results of these findings, however, caused the owner to adopt SYFO as standard for use in drilling all future wells. It is a question whether it will pay to keep this well open when the time comes to place it on the pumps because of excessive rod wear and difficulties of swabbing due to its wide deviation of direction.

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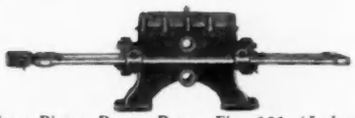
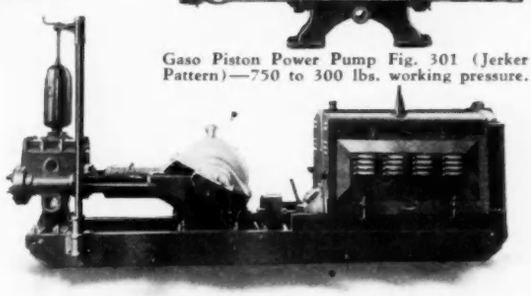
Gaso Portable Pumping Plant Fig. 2010-W for emergency, temporary and semi-permanent service. Capacities from 63 bbls. per hour at 800 lbs. working pressure, to 250 bbls. per hour at 250 lbs. pressure.

Gaso Rodline Pump Fig. 201 —a simple, easily operated pump for general service.

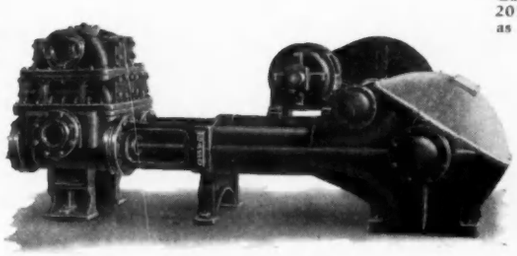


Gaso Piston Power Pump Fig. 301 (Jerker Pattern)—750 to 300 lbs. working pressure.

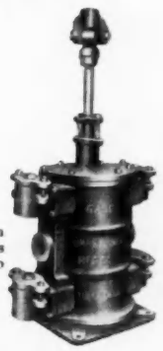


Gaso Portable Pumping Plant Fig. 2010-S—Same pump and power plant as Fig. 2010-W, except mounted on steel skids.

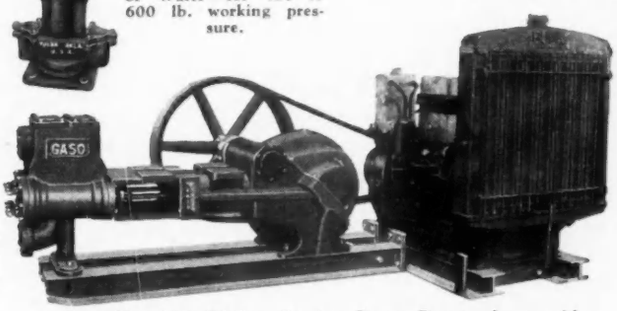
Gaso Walking Beam Pump Fig. 601 for Oil or Water—for 400 to 600 lb. working pressure.



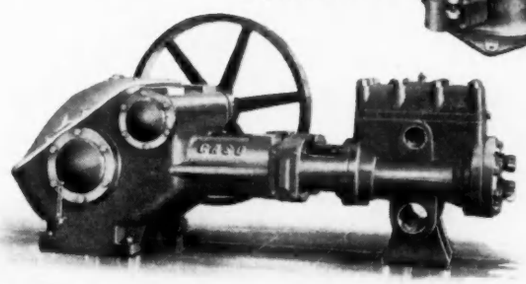
Gaso Fig. 1931 Timken Bearing Suction Pump. Interchangeable liners from 6 to 10″ and 18″ stroke. Also suitable for low pressure discharge service.



Gaso Walking Beam Pump Fig. 604 for Gas or Vacuum—gives 26 to 28 points vacuum.



Gaso Fig. 710 Timken Bearing Power Pump, shown with V-Rope drive from Buda M.A.N. High Speed Diesel Engine. Capacities from 54 bbls. per hour at 1400 lbs. pressure to 500 bbls. at 300 lbs.



Gaso All Timken Bearing Power Pump Fig. 1508. Capacities from 63 bbls. per hour at 800 lbs. pressure to 250 bbls. at 250 lbs. Arranged for any type of drive.

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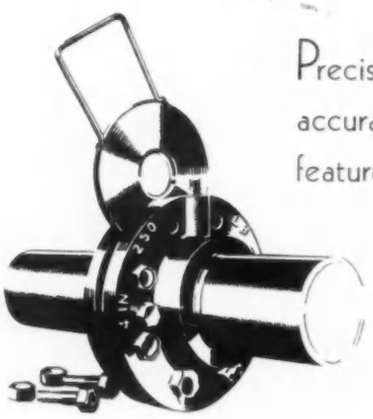
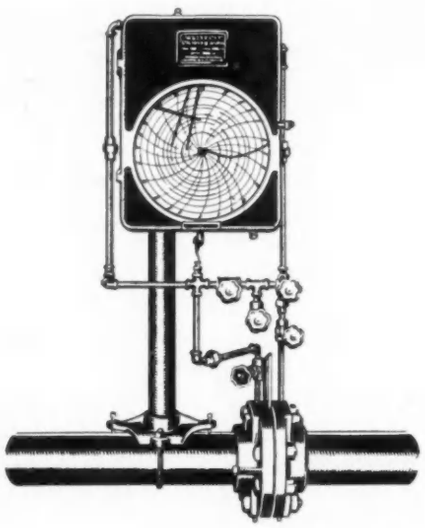


Precise orifices, dependable meters, and accurate, legible records are prominent features of Westcott Orifice Meters.



ALL Metric Orifices are made of cold rolled steel (or other special metal if desired). They are machined accurately with an allowable tolerance of not over one thousandth of an inch. After machining, edges are honed so that they are sharp and free from any microscopic burrs or imperfections. Orifices are then tested with GO and NO-GO gages. Therefore, every orifice of the same diameter will pass the same quantity under the same conditions.

SIMILARLY, every detail in the design, construction, and inspection of Westcott Orifice Meters receives painstaking attention—from the uniform area of mercury chambers and the accuracy and sensitiveness of the recording pen, to keeping moving parts, and consequent maintenance, at a minimum.

A full discussion of the construction, operation and maintenance of Westcott Orifice Meters will be found in Handbook E-2. Positive Integration, a recently developed feature is explained in Bulletin E-16. A copy will be mailed on request.

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MAR 21 1932

THE OIL WEEKLY

March 18, 1932
Vol. 65, No. 1

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Published Weekly by
THE GULF PUBLISHING COMPANY
HOUSTON, TEXAS

S. W. ROBINSON
Editor

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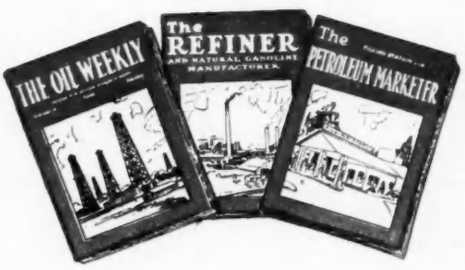

SPECIALIZED OIL JOURNALS
Published by
THE GULF PUBLISHING COMPANY

R. L. DUDLEY, *President*
A. L. BURNS, *Gen'l Manager*
S. W. ROBINSON, *Editorial Director*
J. KENT RIDLEY, *Managing Editor*

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CHICAGO: Room 810, 624 Michigan Avenue, O. R. Waller, Manager.

LOS ANGELES: 416-417 Haas Building, W. E. Green, Manager.

TULSA: 913-916 Hunt Building, J. F. Carter, Jr., Manager.

FORT WORTH: 203 W. T. Waggoner Building, H. H. King, Manager.

Issued Friday of each week. Single copies 15 cents. Subscription price: Domestic $1.00 a year, Foreign $1.00 a year. Entered as second-class mail matter December 23, 1916, at the post office at Houston, Texas, under act of March 3, 1879. Subscription restricted to those engaged in the producing and pipe line branches of the oil business or the manufacture and distribution of oil field supplies. Advertising rates on application.

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VOLUME 65, No. 1 MARCH 18, 1932

THE OIL WEEKLY

SPECIALIZED TO OIL AND GAS PRODUCTION
AND PIPE LINE DIVISIONS

ENGINEERING • NEWS • STATISTICS

The Changing Panorama

"Don't Quote Me, But"

"There seems to be plenty of oil in sight for 1932, but how about the 1933 U.S.A. supply? If East Texas is pegged at around 300,000 barrels per day by a court decree upholding the Texas conservation law, where is that necessary 'billion barrels new oil' per year we have heard talked about coming from?

"No such supply is in sight. It would not be surprising if 18 months from now we see as mad a scramble to develop new oil supplies as is now seen to hold down production. In fact, it seems likely that we shall see such a scramble.

"How long will the executives of the major companies having large storage facilities continue to be glad to withdraw from stocks when it becomes apparent that they may have to take care of their demands by an extensive drilling campaign?

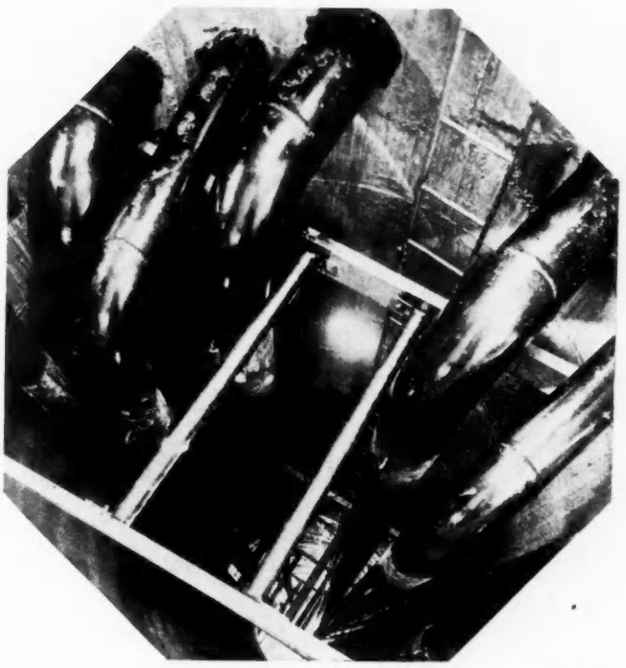
"Will they start filling up storage or stop withdrawals before the campaign is actually on us or will they wait to fill their tanks with higher priced oil?"—from a collection of questions asked us by oil men during the past week.

Can It Rise?

Disregarding the potential below-ground supply which has been the bugaboo of the industry for many months past, and the hysteria of unsettled world economics, the position of the oil industry is such that the average price of crude at the well should be $1.40 per barrel. At that rate for crude, refiners would require 8⅝ cents per gallon for gasoline at the refinery to make normal profits. Probably the two obstacles to normalcy mentioned in the beginning are too great to be overcome in entirety, but there should be means of at least improving conditions from the present status of no profit for anybody. Everybody knows that prices are too low, but a discussion and chart showing how much too low, is interesting. Page 14.

Pipe Lines Do Move

Time was when the pipe liners, direct or secondary sons of Ould Erin almost to a man, went out and laid their lines by main strength and help of such stimulants as the neighborhood afforded. Shades of the ould timers must have stirred last week when the leading engineers of the country laid on the table the results of outstand-



Lines go down 63 feet in this shaft to cross the Houston Ship Channel to the Sinclair Refinery.

Page 19.

ing engineering progress at Tulsa in the shape of one of the finest collections of technical papers dealing with pipe line construction and progress yet presented to one body. We are happy to let readers of THE OIL WEEKLY into the meeting by giving the most important of these technical papers in this issue. They begin on page 51.

Moving Fast

The changing panorama in the oil business is moving rapidly. U. S. Bureau of Mines figures for January, just released (see Page 75) show that while total gasoline consumption of U. S. products (domestic and foreign) was down, the actual domestic consumption of gasoline was up about two per cent over January, 1931. (Pessimistically minded people have compared the figures with the December figures, showing a loss, but the ordinary methods of comparison in consumption made in the past have been to compare a certain month with the same period the previous year.) Exports were down.

February consumption figures have not been released by any official agency, but A. P. I. figures for gasoline stocks showed a decrease week before last as compared with the previous week and last week, despite the fact that runs to stills were up 108,000 barrels a day (up 756,000 barrels for the week), gasoline stocks at the end of the week were up only 232,000 barrels (see Page 68).

And now comes a student of the foreign situation, commenting on J. B. Aug Kessler's plan for world-wide curtailment, and says that the world consumed more oil than it produced by some 44,000,000 barrels of "everything" in 1931, and the U. S. A. lead in producing less oil than it used. Page 12.

The Oil Man's Calendar

MARCH
- 21-27 *Oil Equipment and Engineering Exposition, Los Angeles (Third Annual.)*
- 23-25 *Michigan Oil Men's Association, Detroit, Michigan, (Statler Hotel.)*
- 24-26 *American Association of Petroleum Geologists, Oklahoma City, Oklahoma.*
- 28 *Pacific Coast District A. P. I. Production Division, Los Angeles (Engineers Club.)*
- 28- 1 *American Chemical Society, New Orleans, Louisiana.*
- 29 *Natural Gasoline Association of America, Ranger, Texas (plant operators.)*
- 30 *Texas Railroad Commission, State Proration Hearing, Austin, Texas.*

APRIL
- 4- 9 *Western Petroleum Refiners Association, Excelsior Springs, Missouri.*
- 2-10 *National Aircraft Show, Detroit, Michigan.*
- 6- 8 *American Gas Association, Birmingham, Alabama (Distribution Committee, Technical Section.)*
- 11-16 *American Oil Burner Association, Boston, Mass. (Ninth Annual.)*
- 14-15 *Southwestern District A.P.I. Division of Production, Tyler, Texas (Spring Meeting.)*
- 21-22 *National Petroleum Association, Cleveland, Ohio (Semi-Annual.)*
- 22-24 *Petroleum Industry Electrical Association, Dallas, Texas (Baker Hotel.)*
- 26-28 *Southwestern Gas Measurement Short Course, Norman Oklahoma.*
- 27-29 *National Pipe and Supplies Association, White Sulphur Springs, W. Va.*
- 27-29 *American Welding Society, New York (Annual.)*

MAY
- 4- 6 *National Foreign Trade Council, Honolulu, Hawaii.*
- 9-11 *Natural Gas Department, American Gas Association, Tulsa, Oklahoma.*
- 9-13 *National Fire Protection Association, Atlantic City, N. J.*
- 17-19 *Natural Gasoline Association of America, Tulsa, Oklahoma (Mayo Hotel.)*

JUNE
- 1- 3 *American Petroleum Institute (Mid-Year Divisional Meetings), Tulsa, Oklahoma (Mayo Hotel.)*
- 6- 9 *National Association of Purchasing Agents, Detroit, Michigan.*
- 20-24 *American Society for Testing Materials, Atlantic City, N. J.*

SEPTEMBER
- 14-16 *National Petroleum Association, Atlantic City, N. J. (Annual.)*

NOVEMBER
- 15-17 *American Petroleum Institute, Houston, Texas (Annual.)*

Wolters Goes Home

Brigadier General Wolters, commander of Texas troops enforcing martial law proration in East Texas, asked and was granted relief this week from his command "to return to his long neglected professional and personal business." With him goes about one-third of the soldiers, those remaining to be under command of Col. Davidson. Militia Order No. 22 by authority of Governor R. S. Sterling, limits wells to 72 barrels, effective March 16, following similar order by the railroad commission for the wells which it still controls under court injunction. General Wolters returns to his law practice at Houston which includes representing The Texas Company, his military duties probably having kept him from participation in the anti-trust suit now underway at Austin. In that case, the court now has recessed until March while he considers arguments which have been heard on the validity of the laws upon which the prosecution is based.

A congressman from Maine who has sought an embargo on lobsters to foster his home district fishermen, seems to be the only formidable opposition remaining in house debate on the import excise on oil. Observers take this to mean that the revenue bill will go to the senate this week with the oil tax provisions as written. Page 17.

The relapse of winter which brought unseasonable cold to a large part of the country perhaps for the time halted the growing demand for motor fuel at the pump, but jobbers still fired in orders for gasoline to replenish their stocks. And at the same time rush orders for distillates firmed the price on that product, an optimistic note being that some of the fuel demand is believed to reflect improvement in certain small manufacturing enterprises using that fuel. Gasoline prices, even natural, were tending to decided strength in the Mid-Continent. On the whole, the market situation is better. Page 35.

California Exposition Brings Technical Bodies Together

MANY features of interest have been scheduled for the Third Annual Oil Equipment and Engineering Exposition which will be held from March 21 to 27, 1932, at Alameda Boulevard and 131st Street, Los Angeles. Tool and machinery for use in all branches of the petroleum industry will be on display and the exhibits will include products and materials as well as operating equipment for drilling, production, refining, natural gasoline manufacture, natural gas, pipe lines and marketing. A separate division has been established for marketing; and oils, greases and gasolines will be shown together with all types of equipment for their distribution from the time the refined products leave the refinery until they reach the consumer.

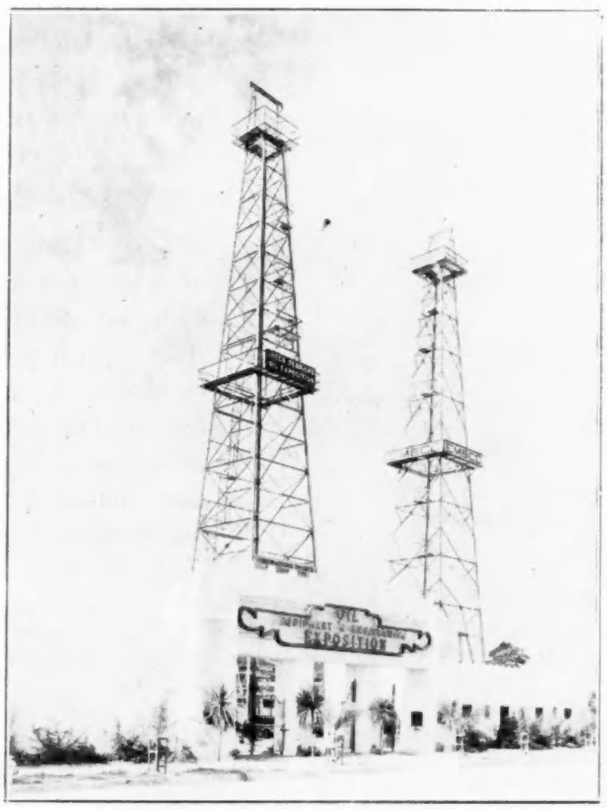
Efficiency in operation is of extreme importance at the present time and the Third Annual Exposition will present the latest developments in tools and machinery to assist operator in increasing that desired efficiency. The manufacturers of oil equipment have been constantly improving their designs with an aim toward meeting the new problems that confront the oil industry; and they are showing these latest developments at the "show" so that oil men from every branch of the industry may have an opportunity to study the new equipment and learn to the greatest extent possible how it will work under field conditions.

The outside space will be used for demonstration purposes as well as for exhibiting the larger and heavier kinds of equipment. Two derricks have been erected on this space and rig equipment will be set up on the derrick floors. Other drilling equipment in actual operation will be located in the main building and will include a complete hydraulic rig installation. Every facility for moving displays has been provided with adequate electric power, gas, water and compressed air conveniently arranged to operate any type of exhibit desired.

Daily Events

The exposition will open daily at 10 a.m. and close at 10 p.m. The formal opening will be at 2 p.m. on Monday, March 21. Governor James Rolph, Jr., of California, will officiate at this ceremony and will deliver an address that will be of particular interest to the petroleum industry at this time. Other speakers will be executives from oil companies who will treat of specific branches of the industry and the problems confronting the operator. The speeches will be broadcast throughout the main building and the grounds by means of the Texico Public Address System which is furnished through the courtesy of the manufacturers of Texico products. This same system will be used during the entire exposition.

The "American Society for Steel Treating Day" will be Tuesday March 22 when the members of the Los Angeles chapter of that society will attend the exposition as representatives. The officers of the chapter are: W. A. De Ridder, chairman; Thomas F. Hutton, vice-chairman; D. C. Miller, secretary; and C. H. Dye, treasurer.

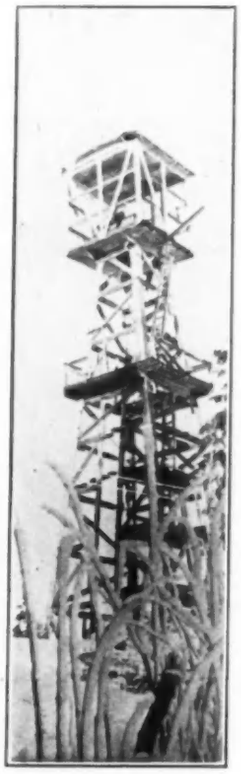


Exposition Gates Ready for Opening

One of the most active days will be "Engineers Day" when a meeting will be held by the American Institute of Mining and Metallurgical Engineers. The day will be Wednesday, March 23, and the meeting will be called at 2 p.m. The officers of the Southern California Section of the Institute which is holding the meeting are: Van Court Warren, chairman; H. Norton Johnson, vice-chairman; and E. Huguenin, secretary-treasurer. Mr. Huguenin has sent formal invitations to the other three founder societies to attend this meeting and the exposition has cooperated with all the societies to make the day as eventful as possible. The officers of the Los Angeles Section of the American Society of Civil Engineers are: A. L. Sonderegger, president; O. A. Stone, vice-president; and Macy Jones, secretary-treasurer. Of the Los Angeles Section of the American Society of Mechanical Engineers: R. R. Robertson, chairman; Ralph J. Reed, vice-chairman; and J. A. Garrett, secretary-treasurer. Of the Los Angeles Section of the American Institute of Electrical Engineers: P. S. Biegler, chairman; F. E. Dellinger, secretary; and A. P. Hill, assist-

(*Continued on page 16*)

U. S. Producers Have Already



THE Kessler Plan, published in The Oil Weekly last week, contemplates organized co-operative action by the oil producers of the world for the reduction of world production to a figure temporarily below the total of world demand.

Kessler proposed the establishment of a declared minima of output for each oil producing country. This study, which is purely speculative in its nature, is intended to develop and indicate the goals at which—in event of the adoption of the Kessler Plan—each national group might aim in fixing its declared minimum of production.

IT is estimated that current world demand for petroleum approximates 1,400,000,000 barrels per annum; that current production of petroleum throughout the world is falling somewhat short, so far during 1932, of last year's total of approximately 1,370,000,000 barrels; and that present stocks of oil stored above ground approximate 750,000,000 barrels. There has been a draft on stocks, but at a rate of withdrawal which is too slow to overcome the psychological results of uncertainty in East Texas, dumping from Roumania, and price-cutting by marketing agents of Soviet Russia. Declines in stocks above ground are not sufficient to offset popular knowledge of greater reserves readily available from natural storage underground.

Let it be assumed, therefore, in the pattern of the Kessler Plan, that total stocks of oil above ground should be reduced to about four months' supply—say 450 million barrels; and that plans should be laid for this reduction to be accomplished in about one year's time. To be conservative, provision might also be made for a decline of about five per cent in world consumption during the first year of the plan.

Working factors, then, are a reduced demand of 1,330,000,000 barrels per annum and a surplus of 300,000,000 barrels of oil in storage above ground. Subtracting the latter from the former, an allowable production of 1,030,000,000 barrels per annum is found, which is about 25 per cent less than the current average. This means that the current average of output must be reduced by approximately 340,000,000 barrels per annum, or roughly 904,110 barrels per day.

How shall this curtailment be apportioned among the various international groups whose co-operation is suggested under the terms of the Kessler Plan? Mr. Kessler's idea is that curtailment is to be achieved through declared minema, and through the desire of members and groups of members to hold down to the possible minimum the amount of their contributions to the financing of the proposed international cartel, such contributions being based on their own declared minima of production. It may be that his suggestion offers, as he wrote, the only practical solution of this complex problem.

The fact is that many national groups of oil producers are already well advanced on programs of restriction and curtailment, and common sense asserts that, if other groups who have continued along the path of selfishness should now accept the policy of co-operation and curtailment, the problem might not be so difficult of solution. Common sense having spoken, equity says that the sacrifices of those who have yet to curtail should be equal, proportionately, to those of American, Venezuelan, Colombian, and other producers who have already restricted their output, in most cases voluntarily.

In order to give credit to those who have already cur-

Achieved Ultimate Kessler Goal

By ROY E. LEIGH

Associate Editor

tailed their output, and to establish an equitable basis for proration, it might be adopted as a basic principle that, in fixing the productive capacity of each national group, that country's greatest actual output during any one of the last three years should be accepted as representing its productive capacity, for purposes of proration. Potential capacities might in some cases be somewhat greater; but the ratio of potential capacity to historical maximum probably would be found to be approximately constant throughout the world.

These statistical maxima are found by reference to the record to have occurred as follows:

Country	Year	Maximum Production
United States	1929	1,007,323,000
U. S. S. R	1931	161,900,000
Venezuela	1929	137,472,000
Roumania	1931	47,600,000
East Indies	1930	46,636,000
Persia	1930	45,828,000
Mexico	1929	44,688,000
Colombia	1929	20,385,000
Peru	1929	13,422,000
Trinidad	1931	9,769,000
Ecuador	1931	1,751,000
Total, Maximum Production of Exporting Countries		1,536,774,000
Plus, Stable Production of Non-Exporting Countries		35,363,000
World Productive Capacity		1,572,137,000

By summing up the foregoing capacity figures, and adding in other figures to represent the avarage stable output of the smaller and non-exporting countries, the productive capacity of the world is established, above, as approximating 1,572,137,000 barrels per annum. Subtracting the allowable production total of 1,030,000,000 barrels per annum, as developed above, it is found that, for purposes of this plan, the exporting countries of the world must reduce their output by 542,137,000 barrels per annum, or about 35 per cent below their established maxima.

Application of the rate of curtailment thus established at 35 per cent would reduce the output of the United States to 654 million barrels, that of the Soviet Union to 105 million barrels, and so on, as follows:

Country	Allowable Production
United States	654,759,950
U. S. S. R.	105,235,000
Venezuela	89,356,800
Roumania	30,940,000
East Indies	30,313,400
Persia	29,788,200
Mexico	[1]29,047,200
Colombia	13,250,250
Peru	8,724,300
Trinidad	6,349,850
Ecuador	1,138,150
Total, Allowable Production, Exporting Countries	998,903,100
Plus, Stable Production of Non-Exporting Countries	35,363,000
Grand Total, Allowable production	1,034,266,100

It is of interest to make comparison of the world productive capacity, thus indicated as approximating 1,572,137,000 barrels per annum, with world demand, herein estimated as approximately 1,330,000,000[2] barrels per annum, as of 1932. An excess of productive capacity of approximately 242,137,000 barrels is apparent, which means that, unless and until world consumption is increased very materially, the exporting countries must continue to hold their output at figures about 16 per cent below their maximum productive capacity.

After the reduction of world stocks, as herein contemplated, the allowable output of the United States would thus appear as approximating 856 million barrels per annum, *which is in line with current average production in this country.* Except for the necessity of reducing world stocks, therefore, the united States appears already to have done its share toward the attainment of Kessler's ultimate goal; and his exemption of United States production from his plan of world control probably would not make any difference at all in the final result.

[1]Mexican production is expected to fall below this total during 1932, as a result of natural decline.

[2]Basic figures on which the conclusion that the world demand for petroleum products will be 1,330,000,000 barrels for 1932, will be found in an article by Mr. Leigh to appear in next week's (March 25) The Oil Weekly.

Crude Prices 42 Per Cent Below Economic Value

By H. J. STRUTH
Staff Economist

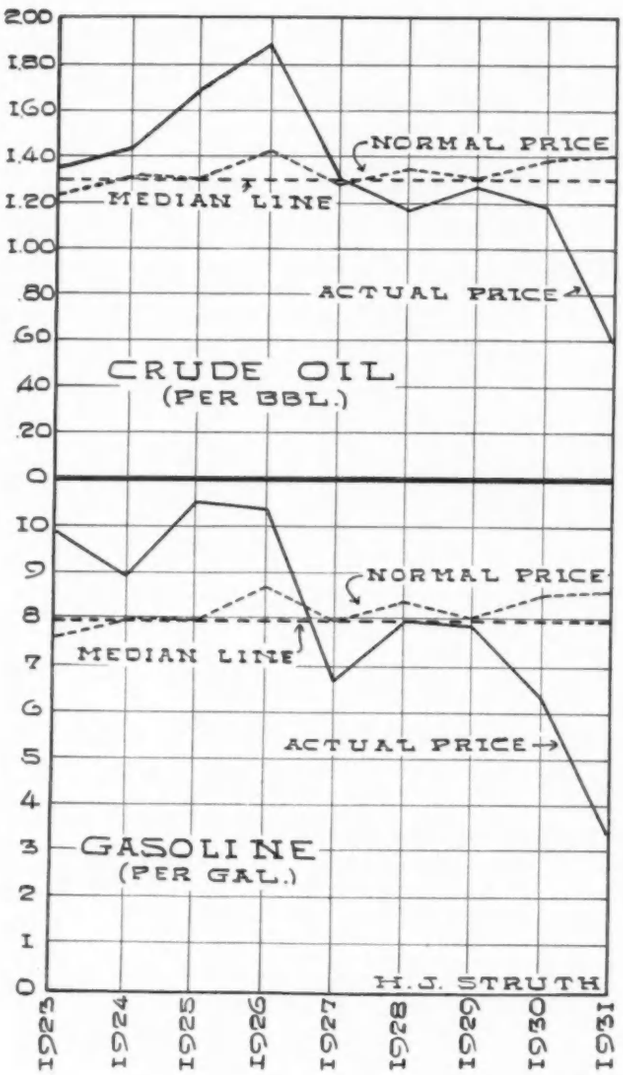
DESPITE the fact that crude oil prices at the well are bringing on an average of but 81 cents a barrel, evidence at hand indicates that the economic value of a barrel of crude is about $1.40. This assumption is based upon the measurement of value by the ratio of demand to supply. However, if crude oil is worth $1.40 a barrel, it is obvious that wholesale gasoline prices would have to be considerably higher in order to justify normal refinery operations. In fact, U. S. motor gasoline in group 3 would have to move up to about 8⅝ cents a gallon to insure a normal profit to the refiner paying $1.40 for crude. Yet, even at present low prices for crude, the refiner is unable to operate at a normal profit. This leads to the question of whether the producer should equalize the crude market to conform to the gasoline market, or whether the refiner shall be made to govern his operations and marketing policies in accordance with the cost of his raw material.

The petroleum industry is confronted with a serious economic dilemma that is leading it nowhere in particular. We hear constantly that it is impossible to conduct refining operations profitably at existing prices for crude oil. On the other hand, few producers are able to show a profit on crude produced at present prices.

Under these conditions, the outlook for both branches is deplorable. On the surface, the situation would imply that the producer cannot expect a higher price for crude until the refiner is able to obtain a higher price for gasoline—or, that the refiner cannot expect to show a profit until the price of crude is brought down to a level comparative with the wholesale market value of gasoline. Underlying the situation, however, is the conviction that low crude oil prices furnish the principal means by which the price-cutter is able to stay in business. As long as the price of raw material is left to the bidding of those whose main purpose is to undersell the general market, there cannot be any semblance of stability in either the crude market or the gasoline market.

Excess Supply Reduced

On the basis of what has been accomplished by the industry in reducing the excessive supply of oil, there is no sound reason to believe that present low prices represent the true economic value of oil. As a result of proration, the excessive supply of oil has been relatively reduced 257,289,000 barrels since January 1, 1929, while the total demand has declined but 78,438,000 barrels. In fact, the ratio of demand to supply is higher now than it has been since 1926. During the year ending December 31, 1931, the ratio of demand to supply stood at 63.9 per cent; 4.6 per cent above the ratio of 1929, the most profitable year in the industry's history. In 1929, with a ratio of demand



Trend of Crude and Gasoline Prices in Relation to Normal as Indicated by Ratio of Demand to Supply of All Oil.

to supply of all oil of 59.3 per cent, crude oil at the well averaged $1.27 a barrel, while U. S. motor gasoline in Group 3 wholesaled at 7.8 cents a gallon. Last year, with a materially improved statistical position, the producer received an average of but 60 cents a barrel for crude and the refiner sold U. S. motor gasoline in Group 3 at an average of but 3.4 cents a gallon.

The accompanying table shows the supply and demand of all oils for the past nine years, expressed in demand-supply ratio and relative and actual values of crude oil and gasoline. The chart portrays the rise and fall of prices over this period, and shows the departures from indicated economic values. It will be noted that the median index, representing the midway point for each group of factors, indicates for the basic demand-supply ratio of 59.5 a price of $1.30 a barrel for crude and 7.9 cents a gallon for U. S. motor gasoline. On this basis, each cent composing the wholesale price of gasoline is equivalent to 16.2 cents in the posted price of crude. At this rate, it is apparent that crude and gasoline prices are now somewhat out of line. Either the refiner should be getting five cents a gallon for U. S. motor gasoline, or the producer should be selling crude oil at an average price at the well of about 50 cents a barrel. This indicates, also, that a price of one dollar a barrel for crude should be accompanied by a refinery gasoline price of 6⅛ cents a gallon.

Influences Not Statistical

It will also be noted that when the demand-supply ratio was 64.6, in 1926, crude at the well averaged $1.89 a barrel and gasoline sold at the refinery for 10.3 cents a gallon. The year 1929, the period of greatest profit to the industry, showed a remarkable degree of proximity to normalcy as indicated by the demand-supply ratio index. In that year, the index indicated a normal crude price of $1.30 a barrel; the average actually received having been $1.27, while the value of gasoline was indicated at eight cents a gallon; the actual price received averaging 7.8 cents a gallon. Since the index of supply and demand has failed to exert any influence upon the price of oil during 1931, prices having departed radically from indicated normal, it is apparent that factors other than statistical exerted an unfavorable influence upon the price structure. As everyone knows, East Texas was the principal adverse factor in undermining the industry's price structure last year, following the earlier threat of flush oil in Oklahoma City. Yet, subsequent success in stemming the untimely flow of oil in these areas, bulwarked by a nation-wide compulsory curtailment movement, has been rewarded by only a modest advance in the crude market and practically no improvement in the gasoline market.

If the Railroad Commission of Texas and the Corporation Commission of Oklahoma are as powerful to prevent over-production as results have shown, there should no longer be any reason to regard alleged potential supply as a factor unfavorable to normal operation. If each state has the right to determine the rate of flow best suited to safeguard reservoir energies of various oil pools, there no longer should be any reason to undervalue petroleum and its products. In fact, as a means of conserving the oil supply, it would be to the best interest of all concerned to sell oil at justifiable economic value instead of allowing fear to dominate the seller to the advantage of the buyer. It appears logical to assume that reckless abandon in the development of existing and future oil pools is a thing of the past. States and the government of the United States have taken a stand on the conservation of natural resources that will undoubtedly prevent the recurrence of uncontrolled production of oil from any pool in the future.

With the prospect of limitation of production from all pools in the United States definitely assured, it must sooner or later become apparent to all oil men that the potential supply of oil will be governed only by the rate of flow limitation found by each state to be most practical in the prevention of physical waste. This means that the industry may soon be obliged to seek new sources of supply to maintain market requirements. It could mean an actual "shortage" of current supply should demand suddenly exceed the allowable output of existing major oil pools of the United States. Under these conditions, the producer is entitled to receive a better price for his crude; a price that would more closely conform to the economic value indicated by the ratio of demand to supply.

Since initial production will probably cease in the near future to be regarded as an index of potential supply of oil (if it has not already reached that stage) it is apparent that the potential of East Texas, Oklahoma City, Kettleman Hills, or any other field in the United States has ceased to be a market factor. It is apparent, therefore, that the price of gasoline has outweighed potential crude supply as a market factor. It is also apparent that higher crude prices will force higher gasoline prices and prove an effective blow against the skimming plant operator that has persistently undersold the gasoline market because of his ability to pick up "distress" crude oil at sacrifice prices. In all fairness to the producer, the refiner and the marketer, would it not be a decisive victory for the industry if crude and gasoline prices were increased to their economic value. Wouldn't that move eliminate to a large extent the ruthless price cutter? Wouldn't the ultimate consumer of gasoline begin to more fully appreciate the unfair rate of taxation he is paying to the various states?

In view of what has been accomplished during the past year and in view of the gradual tightening of legal measures against physical waste of natural resources, the producer is in a position to demand a better price for his oil. With the bugaboo of potential practically eliminated, the time seems to have arrived when the industry can take a united stand on the right to receive a reasonable, fair price for crude oil and for all petroleum products, particularly gasoline. As it is, the price-cutter has deceived the public of fair values and the various states, by increasing the tax burden upon the public have covered up the deficiencies that have gradually placed the oil industry in its present deplorable condition.

Year—	Total Supply (Thous. Bbls.)	Total Demand (Thous. Bbls.)	Ratio %	Price of Crude Indicated	Price of Crude Actual	Price of Gasoline Indicated	Price of Gasoline Actual
1923	1,345,909	754,360	56.0	1.23	1.35	7.6	9.8
1924	1,353,246	805,062	59.5	1.31	1.44	8.0	8.9
1925	1,422,571	840,816	59.1	1.30	1.69	7.9	10.5
1926	1,413,695	913,030	64.6	1.42	1.89	8.7	10.3
1927	1,611,260	943,992	58.6	1.29	1.30	7.9	6.7
1928	1,659,176	1,015,391	61.2	1.35	1.17	8.3	7.9
1929	1,860,525	1,103,203	59.3	1.30	1.27	8.0	7.8
1930	1,724,446	1,082,949	62.8	1.38	1.19	8.5	6.3
1931	1,603,236	1,024,765	63.9	1.40	.60	8.6	3.4
Median			59.5	59.5	1.30	7.9	

California Exposition Brings Technical Bodies Together

(*Continued from page 11*)

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The importance of welding in all branches of the petroleum industry is well recognized and many men connected with this work will visit the exposition on the "American Welding Society Day," Saturday, March 26. The Los Angeles section of this society is particularly interested in the oil industry and has done much to increase the efficiency of welding operations in every branch. Its officers are: Turner Smith, president; George Carrel, vice-president; and Merrill Turner, secretary.

Technical Exhibits

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View of Exposition Exhibits in Place

Fight Continued in House on Excise Tax

Opposition Weakening

WASHINGTON, D. C.—General debate on the revenue bill which contains provisions for an excise of four cents per gallon on lubricating oils and a special levy of one cent per gallon on foreign oils, is being continued in the house of representatives with no prospect that the measure will reach a vote before next week. Democratic and Republican leaders who control the allotment of time are all in favor of the bill and show no disposition to limit debate as it appears that sentiment in favor of the sales tax is growing hourly.

There has been little discussion of the tax on lubricating oils but opposition to the tax or tariff on imported oils seems to have crumbled since its acceptance by Representatives Allen T. Treadway of Massachusetts and Fiorello H. LaGuardia of New York and other congressmen from the Atlantic seaboard. Representative John E. Nelson of Maine stands almost alone in opposition to the tariff on oils and he is under heavy fire on account of his recent advocacy of an embargo on lobsters for the protection of the New England fishing industry.

The fate of the two oil items seems inseparably bound up in that of the general sales tax, the acceptance of which seems highly probably insofar as the lower house is concerned.

WASHINGTON.—A bitter fight Monday centered around the excise taxes on imported oils, the fate of which rests upon the success of the manufacturers' sales tax.

Concerted opposition of the industrial East, particularly New England, and of progressives from the Middle and Northwest has been brought to bear upon the oil tax, denominated by them a tariff subterfuge.

While the house of representatives has not yet reached the point of considering the revenue bill section by section for amendment at this writing, the line of attack has been clearly marked out. It will be directed particularly at the sales tax, of which the oil levies are an integral part, and will be based upon the alleged burden on the public in general.

The sales tax provisions were adopted by the ways and means committee only after exhaustive exploration of other avenues of revenue. "There is," the committee asserted in its formal report on the bill, "no other source of revenue which will yield the amount imperatively required with as little protest, as little annoyance, and as little disturbance to business as a manufacturers' excise tax."

The oil tax would cost New England mills using oil as fuel many millions of dollars a year, representatives of that section contend. It would, allege others, add to the wealth of the Rockefellers and the large oil companies. Prices of oil and gasoline will be increased to every user, it is asserted. These, in brief, are the arguments presented by the opponents.

Leaders of the ways and means committee, both democrats and republicans, are aligned behind the sales tax. If others do not like it, they challenge, let them present a satisfactory substitute. The sales tax was adopted only after long study, as a last resort and with full knowledge of the bitter opposition it would meet. But the committee could do nothing else, for there were no other taxes which would raise the nearly one and one-quarter billion dollars needed to balance the budget.

When the committee met to consider the new revenue bill it was faced with several questions which must be answered before the measure could be drawn. The first was whether the budget should be balanced; the committee decided it should. The second was to tax the rich, in accordance with the ever increasing demand that wealth bear its fair share of the burden; the committee went as far as it could in that direction, with increased surtaxes and estate taxes and a new gift tax, but it could go only so far for it was realized that excessive taxation would defeat its own purpose.

Having gone thus far, the committee found itself short by many hundred million dollars of the goal it had set. Then it was faced with the problem of taking money from the general purse, having surveyed the possibilities of economy in the government's own operations and finding they presented little hope. Taxes on special industries were considered; the inevitable conclusion was that they would handicap business to such an extent as to fail to return the revenues needed. The only alternative was to spread the tax over a wide area, take such steps as possible to prevent pyramiding and by lightening the burden on the few special industries which the treasury had singled out give them a chance of recuperating from the depression without sinking other industries into the pit. That meant the sales tax, already in effect in Canada and a number of other countries, apparently without ill effects.

This, then, is the background of the sales tax. It meets, the committee declares, the six fundamental tests of a successful tax: Low rate, avoiding undue burdens; certainly of return; prevention of pyramiding; uniform imposition without discrimination; a minimum of administrative problems, and assurance of sound administration.

Numerous substitutes for the sales tax will be proposed during the consideration of the measure in the house, but leaders in both parties are confident that the end of this week will see the bill sent to the senate, still containing the sales tax. There will be some increase in exemptions, it is expected, but the general plan will be adhered to.

Austin, Texas.—Judge J. D. Moore has recessed the oil ouster suit to March 28, at which time he will rule on the constitutionality of the anti-trust laws of Texas. Following this, bills of exception to the Allred petition will be heard. These contend that the charges in the petition are too vague and uncertain to be answered, and that the material included is irrelevant.

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Opposition Weakening

WASHINGTON, D. C.—General debate on the revenue bill which contains provisions for an excise of four cents per gallon on lubricating oils and a special levy of one cent per gallon on foreign oils, is being continued in the house of representatives with no prospect that the measure will reach a vote before next week. Democratic and Republican leaders who control the allotment of time are all in favor of the bill and show no disposition to limit debate as it appears that sentiment in favor of the sales tax is growing hourly.

There has been little discussion of the tax on lubricating oils but opposition to the tax or tariff on imported oils seems to have crumbled since its acceptance by Representatives Allen T. Treadway of Massachusetts and Fiorello H. LaGuardia of New York and other congressmen from the Atlantic seaboard. Representative John E. Nelson of Maine stands almost alone in opposition to the tariff on oils and he is under heavy fire on account of his recent advocacy of an embargo on lobsters for the protection of the New England fishing industry.

The fate of the two oil items seems inseparably bound up in that of the general sales tax, the acceptance of which seems highly probably insofar as the lower house is concerned.

WASHINGTON.—A bitter fight Monday centered around the excise taxes on imported oils, the fate of which rests upon the success of the manufacturers' sales tax.

Concerted opposition of the industrial East, particularly New England, and of progressives from the Middle and Northwest has been brought to bear upon the oil tax, denominated by them a tariff subterfuge.

While the house of representatives has not yet reached the point of considering the revenue bill section by section for amendment at this writing, the line of attack has been clearly marked out. It will be directed particularly at the sales tax, of which the oil levies are an integral part, and will be based upon the alleged burden on the public in general.

The sales tax provisions were adopted by the ways and means committee only after exhaustive exploration of other avenues of revenue. "There is," the committee asserted in its formal report on the bill, "no other source of revenue which will yield the amount imperatively required with as little protest, as little annoyance, and as little disturbance to business as a manufacturers' excise tax."

The oil tax would cost New England mills using oil as fuel many millions of dollars a year, representatives of that section contend. It would, allege others, add to the wealth of the Rockefellers and the large oil companies. Prices of oil and gasoline will be increased to every user, it is asserted. These, in brief, are the arguments presented by the opponents.

Leaders of the ways and means committee, both democrats and republicans, are aligned behind the sales tax. If others do not like it, they challenge, let them present a satisfactory substitute. The sales tax was adopted only after long study, as a last resort and with full knowledge of the bitter opposition it would meet. But the committee could do nothing else, for there were no other taxes which would raise the nearly one and one-quarter billion dollars needed to balance the budget.

When the committee met to consider the new revenue bill it was faced with several questions which must be answered before the measure could be drawn. The first was whether the budget should be balanced; the committee decided it should. The second was to tax the rich, in accordance with the ever increasing demand that wealth bear its fair share of the burden; the committee went as far as it could in that direction, with increased surtaxes and estate taxes and a new gift tax, but it could go only so far for it was realized that excessive taxation would defeat its own purpose.

Having gone thus far, the committee found itself short by many hundred million dollars of the goal it had set. Then it was faced with the problem of taking money from the general purse, having surveyed the possibilities of economy in the government's own operations and finding they presented little hope. Taxes on special industries were considered; the inevitable conclusion was that they would handicap business to such an extent as to fail to return the revenues needed. The only alternative was to spread the tax over a wide area, take such steps as possible to prevent pyramiding and by lightening the burden on the few special industries which the treasury had singled out give them a chance of recuperating from the depression without sinking other industries into the pit. That meant the sales tax, already in effect in Canada and a number of other countries, apparently without ill effects.

This, then, is the background of the sales tax. It meets, the committee declares, the six fundamental tests of a successful tax: Low rate, avoiding undue burdens; certainly of return; prevention of pyramiding; uniform imposition without discrimination; a minimum of administrative problems, and assurance of sound administration.

Numerous substitutes for the sales tax will be proposed during the consideration of the measure in the house, but leaders in both parties are confident that the end of this week will see the bill sent to the senate, still containing the sales tax. There will be some increase in exemptions, it is expected, but the general plan will be adhered to.

Austin, Texas.—Judge J. D. Moore has recessed the oil ouster suit to March 28, at which time he will rule on the constitutionality of the anti-trust laws of Texas. Following this, bills of exception to the Allred petition will be heard. These contend that the charges in the petition are too vague and uncertain to be answered, and that the material included is irrelevant.

Mechanical Engineers Hold Pipe Line Symposium at Mid-Continent Meeting

By FLOYD SWINDELL
Staff Representative

Tulsa.—The Mid-Continent Section of the Production Division of the American Society of Mechanical Engineers, in a special meeting here March 10 brought forth a program in which information heretofore considered confidential was traded freely among the men who are facing a pipe line problem. Until recently, most companies engaged in pipe line construction and operation divulged but little information on their special problems and practically no co-operation was had among engineers in this branch of the industry. With the advent of transcontinental oil, gas and gasoline lines and the necessity for multiple systems composed of lines of various sizes, pipe line engineering has become increasingly complicated and the necessity of co-operation more acute. With this condition in mind the recent program was planned to bring together the men who are pioneering new ideas in the construction and operation of lines.

Nine papers considered the subjects of friction losses in gasoline pipe lines, operation of automatic pumping stations, methods of laying pipe lines across the Mississippi River, repairing leaks in crude oil lines in the Mississippi River, the pipe line tunnel under the Houston Ship Channel, high speed Diesel engines, gear increasers and reducers, closed water systems for Diesel pumping stations and equivalent lengths of pipe lines were considered. W. G. Heltzel, chief engineer for Stanolind Pipe Line Company and chairman of the Production Division of American Society of Mechanical Engineers, presided. The first paper, "Friction Losses in Gasoline Pipe Lines," by Stanley Learned, engineer for Phillips Petroleum Company, brought out that there are two schools of thought among pipe line engineers concerning the design of gasoline lines. One group adheres to the idea that gasoline lines differ so fundamentally from oil lines that the use of oil pipe line formulae is impractical. The other group, of which Mr. Heltzel is a member, adheres to the belief that formulae long used by oil pipe line engineers are adaptable with special modifications.

Little Known About Gasoline Viscosity

One of the surprising things brought out in Mr. Learned's paper was that very little is known and practically nothing has been published in regard to the viscosity of gasoline, information which is essential in design of pipe lines to carry this substance. Phillips Petroleum Company in the recent construction of its gasoline line used a modified Williams and Hazen's formula. The company is keeping a careful record of daily operation of the line and hopes that by co-operation much can be learned regarding friction losses in gasoline lines. One of the points upon which considerable difference of opinion exists is the factor which should be used for roughness of pipe.

The second paper on the program was, "Operation of Automatic Pumping Stations," by A. N. Horne, engineer for Empire Pipe Line Company and chairman of the Mid-Continent Section, Production Division of American Society of Mechanical Engineers. Stations at Vinco, Oklahoma, and Sand Springs were the first automatic stations to be constructed on a commercial scale. The Vinco station was an old station converted to automatic operation while the Sand Springs station was designed and constructed with that in mind. Mr. Horne's paper presented briefly the general plan of their automatic station and pointed out some of the operating difficulties, giving as his personal opinion the suggestion that operators may turn from the usual type of gate valve to the plug-cock type at points of automatic control. One of the main operating difficulties now encountered is in the use of crude oil in transportation for lubricating purposes. When first put into operation the station used a small screen which had to be changed every four hours because of foreign material carried in the oil. The size of these screens has now been increased and a change is necessary only at 12 hour intervals. It was a general concensus of opinion that automatic pipe line stations are practical and that probably the idea will be more universally adopted when a few more of the kinks have been eliminated.

Repairing Leaks

"Repairing Leaks in Crude Oil Lines in the Mississippi River," by J. J. Boyd, Stanolind Pipe Line Company, and "Methods of Laying Pipe Lines Across the Mississippi," by J. T. English, Prairie Pipe Line Company, were illustrative of the ingenuity of the modern pipe line engineer in helping to bring his portion of the industry in line with present economic trends.

J. B. Harshman, engineer for Stanolind Pipe Line Company, presented "High Speed Diesel Installations Geared to Centrifugal Pumps." Mr. Harshman reviewed initial and operating costs and deficiencies as compared with electrically driven pumps, bringing out figures which promoted the liveliest discussion of the day. W. H. Stueve of Oklahoma Gas and Electric, took the lead in presenting the viewpoint of the public utility companies who are serving pipe line stations.

"Gear Increasers and Reducers for Crude Oil Pipe Line Pumping," by W. E. Sykes of Farrel-Birmingham Company, presented historical data regarding the use of various types of gears and a number of illustrations showing modern equipment and gear adaptation.

From an economic viewpoint perhaps the most important paper of the day was that of Floyd E. Warterfield, Jr., of Oklahoma Pipe Line Company, who presented "Closed Water Systems for Diesel Pipe Line Pumping Stations." Through the experience of Shell Petroleum Corporation it was shown that initial and operating costs are materially reduced by use of the closed system and that a majority of the mechanical difficulties are eliminated.

"Equivalent Lengths of Pipe Lines," by W. G. Heltzel of Stanolind Pipe Line Company was perhaps the most technical paper on the program and was not fully presented because of the fact that the program had run behind schedule. In the early days of pipe line construction when some companies had but single lines the engineering problems were comparatively simple. Looping of various sizes and lengths has complicated the problem until fundamental formulae no longer adequately serve the pipe line engineer in predetermining the necessary size and length to gain the desired increases through multiple systems. Mr. Heltzel has worked intermittently during the last four years on formulae by which equivalent lengths of pipe lines might be determined after reducing the problem on the basis of some arbitrary diameter. The paper will not be released for publication at this time due to the fact that the work is not completed but Mr. Heltzel stated that he hoped that he might be able to make it available within the near future.

Upon conclusion of the regular program a picture on the the use of carbon dioxide in extinguishing fires was presented by Walter Kidde and Company of New York.

Tunnel Carries Lines Under Stream Used By Ocean Vessels

By FRANK HADLEY
Sinclair-Texas Pipe Line Company

WHEN it was decided Sinclair Pipe Line Company should lay a pipe line into Sinco refinery, the biggest problem—was laying this line across the Houston Ship Channel.

For those who may not know, the Houston Ship Channel is a deep water way for ocean going vessels to come into the City of Houston. This has been made by dredging from the Gulf of Mexico at Galveston, about 50 miles southeast of Houston, through the Gulf of Galveston, then up Buffalo Bayou the last 20 miles into Houston.

This channel is under the control of the War Department and the operation of traffic within Harris County is governed and regulated by the Port Commission of the Port of Houston. Hence authority for crossing must be obtained from the Director of Port, and permit for crossing granted by the War Department.

All former pipe lines had been laid on the bottom of the channel after dredging had been done to meet the requirements of the War Department. These called for a clear channel 30 feet deep and 150 feet wide on the bottom, in 1920, but in 1931, it was a channel 45 feet deep and 350 feet wide on the bottom. The cost of dredging to meet these requirements was investigated, the location of crossing carefully considered, especially since the desired location was near existing lines, and the outlet on opposite bank being outside property probably requiring outright purchase. The amount of excavating necessary, the disposal of same, the distance to such disposal and the excessive excavation due to quick sand conditions, were just as carefully considered.

Soil Tests

While dredging was being considered, the proposition and feasibility of a tunnel was just as thoroughly investigated. The first inquiries as to the nature of subsurface soils were very discouraging and even ridiculed, but encouragement was revived when an old well driller was found who gave better reports on the soil at depths from 75 to 100 feet. To verify this he was employed to drill some test holes and take cores of the different soils. One test was made on the south bank, then one on the north and as they checked very closely further tests were left to contractor if desired.

Core tests showed as follows:

Readings, — or —, are elevations above or below mean low tide.

Mostly sand to	—44
Tough red clay from	—44 to —63
Blue clay	—74 to —92

Under these encouraging tests and samples of soil, plans and specifications for tunnel were drawn, the principal points as follows:

A vertical circular concrete shaft on each bank, inside diameter 10 feet, outside diameter 13 feet, hence 18-inch wall, reinforced.

A concrete tunnel connecting these shafts, tunnel to be an inverted U shape, flat bottom, inside width and height eight feet with a 12-inch wall.

A ladder and channel irons in each shaft and concrete inserts in tunnel where desired.

In order to consider tunnel prices with dredging, plans and specifications were given contractors for bids. The specifications called for a lump sum bid for tunnel and shafts of definite length as drawn, but if a longer or shorter shaft or tunnel became necessary, then a price per foot of shaft or tunnel was to be added or deducted accordingly. Also if re-

Aerial view of Houston Ship Channel showing where pipe line crosses through the use of the new tunnel

THE OIL WEEKLY is pleased to be able to present in this special section the important papers presented at the March 10th meeting of the Mid-Continent Section of the American Society of Mechanical Engineers at Tulsa. The meeting was largely devoted to pipe line subjects and the papers published here in effect comprise the latest developments in the mechanics of pipe line construction and operation. We are indebted to the officers of the Mid-Continent Section who have made it possible to give the industry this prompt release on their proceedings.

Editor's Note: See The Oil Weekly, September 4, 1931, page 22, for first story on the tunnel construction.

At the left shows the method of building forms for the tunnel at the start

inforcement in tunnel was necessary, bid to be a price per pound in plate. If cribbing was necessary a definite price per "M" bd feet in place. And if necessary to work under compressed air a lump sum bid for this was asked.

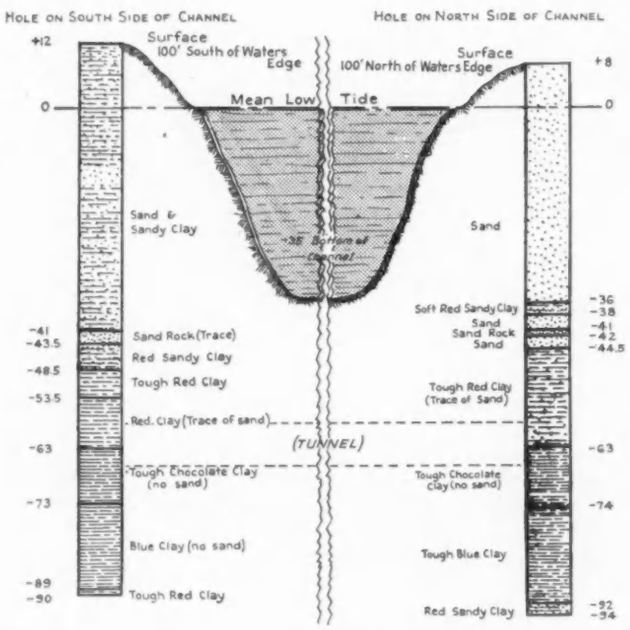
After tunnel bids were received, and considered with dredging estimates, and the advantages and disadvantages of each were carefully weighed, the tunnel was decided upon and contract let to the Subway Engineering Company of Chicago, Illinois, who proceeded to get tools and equipment upon the job at once, and started south shaft June 1, 1931.

The concrete shafts were built above the surface of the ground in two foot sections, and excavation within the shaft was done by hand, or with a clam shell bucket operated by a wooden boom. As this excavation proceeded, the shaft sank of its own weight. To help the sinking, the first section was formed on the outside circumference with a steel boiler plate formed in a perfect cylinder, and the forming lumber for this first concrete section was tapered upward on 45 degree angle from the outside to the inside. On the bottom of this boiler plate a 4" x 4" angle iron, curved to proper radius, was riveted to make a cutting edge for the shaft. As these two foot sections of concrete were built one on top the other, and as the sand or soil within was excavated, the shaft sank readily. The forming lumber, which was made up in sections, was easily put together and removed. The forms were generally taken off in one or two days after concrete was poured, as a quick setting cement was used on 50-50 mix with Portland cement.

The sinking of the shaft progressed rapidly at the start but slowed up as the depth increased, due to slow excavation through several feet of water in shaft as long as quick sand was encountered.

A difficult job was the sealing off of water when the clay soil was encountered. This trouble increased when a few scattering sand rocks got under the cutting edge of the shaft, but this sealing off was finally accomplished by pouring two feet of concrete in the bottom of the tunnel. After this concrete set sufficiently, the water was pumped out, holes cut through shaft and grout pipes inserted and the outside of the shaft thoroughly grouted under 100 pounds pressure; until the grout showed up on surface outside of shaft. After this was completed, the concrete in bottom was cut out and underreaming of shaft started. The remainder of the shaft was completed by concreting in one- and two-foot sections underneatth the cutting shoe as excavation continued downward, until suitable soil for the tunnel location was decided upon, which was at —66 for the tunnel floor.

During the time the south shaft was constructed, the north shaft was started and carried to completion three

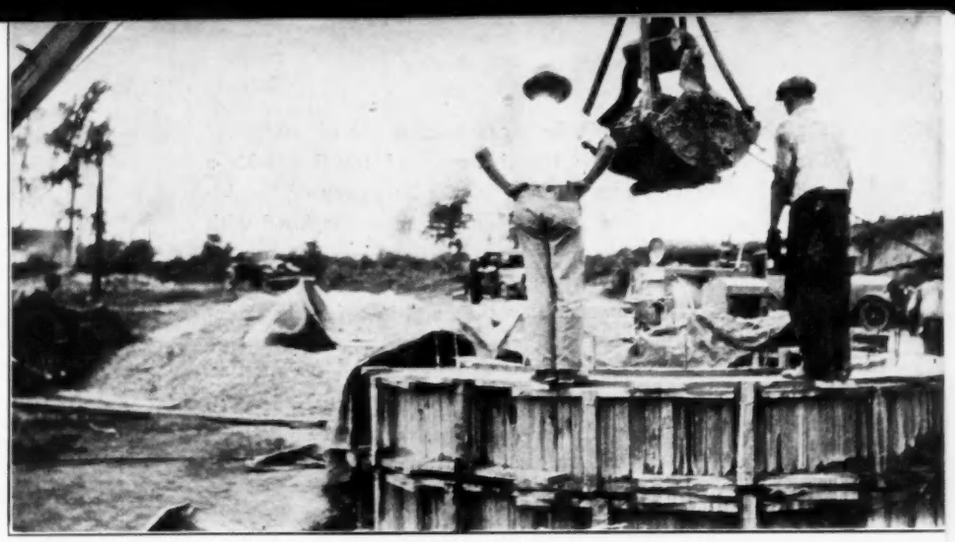


Log of formations penetrated by shafts and location of the tunnel below the channel

weeks before the south shaft. No difficulty was experienced in north shaft in sealing off the water when clay was encountered and the sinking of the shaft finally stopped with cutting shoe at —62. After which underreaming and concreting downward was continued, until an underground vein of water was struck at —79 which made it necessary to seal the bottom with concrete, and because of this water vein, the tunnel was started and completed from south shaft.

As soon as the tunel was started, it was discovered cribbing was necessary on account of the slack nature of the shaly red clay, when exposed to the air. This cribbing was made of 3" x 6" in five pieces, two pieces six feet long and three pieces four feet long formed in an arch, and large enough to leave a minimum space of 12 inches outside of the regular steel forms which form the inside of the tunnel. The concrete was poured between the inside form and the cribbing, the floor being poured first, then sides poured upward from the bottom and then the top was rammed in from the front.

Excavation in the tunnel was done by compressed air spades, and removal of earth was hauled out in small cars. Excavation was extended ahead of concrete work in this



Digging on the tunnel was done by hand with clam shell buckets

tunnel about 10 feet to 12 feet, a day's work, because of cribbing; but in other tunnels of this size where soil is of such nature cribbing is not required, then three-foot to six-foot sections is about the limit.

To be prepared for unseen conditions, air locks for tunnel were ordered and received before the work was started and at 38 feet and 56 feet from center of south shaft slots were left in the concrete for installing these air locks on short notice is necessary. Because water seepage kept increasing, and depth of soil between top of tunnel and bottom of channel was decreasing, the minimum thickness 22 feet, air pressure was deemed necessary at about 250 feet. Therefore an air lock was installed at 194 feet and one at 218 feet making a 24 foot chamber for the men to enter and exit. While these air locks and equipment for furnishing air was being installed, the end of tunnel was sealed with concrete.

Showing method of running concrete in the tunnel. All cribbing was left in

The air for this work was obtained from the Houston Power and Light Company about 200 yards distant, therefore only necessary to have pressure tanks for carrying this air at 100 pounds and another tank and regulator to reduce to working conditions, which was from five pounds ot eight pounds. At this low pressure most any one could enter and work. In fact working conditions were better and cooler under compressed air than before, and greater speed was obtained. The night crew did the digging and the day crew did the concreting and made 12 feet each day. This was continued until the north shaft was struck, tied into, and concreted. After setting several days the north shaft was cut through, and the tunnel was found to be three inches off center.

The alignment of the tunnel was produced from two plumb bobs suspended in the south shaft six feet apart. These were made with No. 25 piano wire with a 10-pound weight suspended on each wire, and each weight brought to rest in a bucket of water.

The cutting through of the north shaft and installing the ladders and channels in each shaft and concrete pipe supports in the tunnel completed the work of the contractor.

After completion of the tunnel, there was still a problem of no minor importance; namely, that of installing the lines within the tunnel.

The buildings for each shaft had been planned, ordered and received beforehand, and one erected before the contractor left the job. Each was a steel frame strong enough for hoisting pipe and materials in and out of the tunnel, and each closed in with galvanized corrugated iron. The north building was a square low type with ventilator, and the south one tall pyramid shape with a lean-to offset to the north for locating a motor and winch to one side of, and clear of the shaft. This five horsepower motor and winch operated as a hoist over a pulley located in the top of the building, for pulling the long joints of pipe into, and through the long door made in sections on the south side. By this means the pipe was lowered to the bottom, and placed on two small carts and hauled to any part of the tunnel desired.

There were four 12-inch and four eight-inch pipes laid in the tunnel; two 12-inch on each side on concrete supports, and then an eight-inch above each 12-inch, laid on two-inch pipe between.

All lines within the tunnel were electric welded, except the tie-in welds near south shaft, which were acetylene welds, as were all the welds in each shaft.

The right angle turns at the bottom and top of each

shaft were made with tube turns to give the oil an easier flow. The lines in the tunnel were tied together with a cable in several places because of the buoyancy of the 12-inch lines of standard pipe; when the tunnel is filled with water.

All lines were brought out on the surface near the top of each shaft on the same elevation, and in a fan shape design with a gate valve on each line about six feet outside the shaft. This gives easy access of connection.

After lines were completed they were all tested out with water under 800 pounds pressure and remained under this test for 14 hours with very slight drop in pressure. After this test, one 12-inch line was connected, and filled with oil.

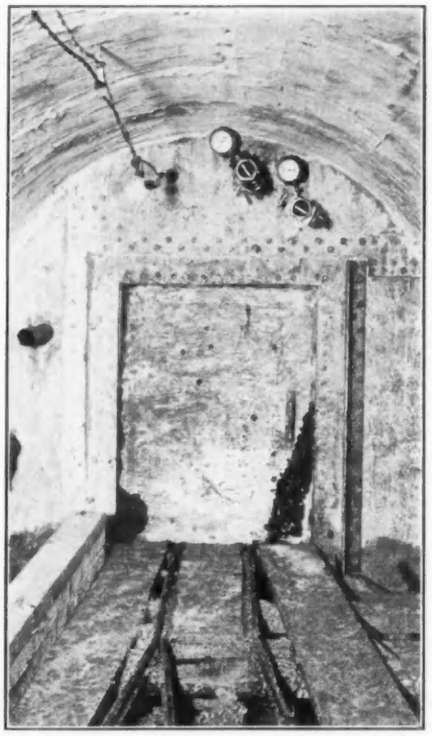
When this was done, the tunnel was filled with fresh water, the purpose of which is three-fold:

First—the preventing of corrosion, which is excessive in a tunnel due to dampness and more so here because of the briny influx from the gulf.

Second—to prevent fire or explosion within the tunnel, and serious damage that might result therefrom.

Third—to reduce to a minimum any contraction or expansion in the tunnel.

The construction of the tunnel and the lines therein was completed without a single injury of any importance, and we still believe we made the right choice—A tunnel instead of dredging.



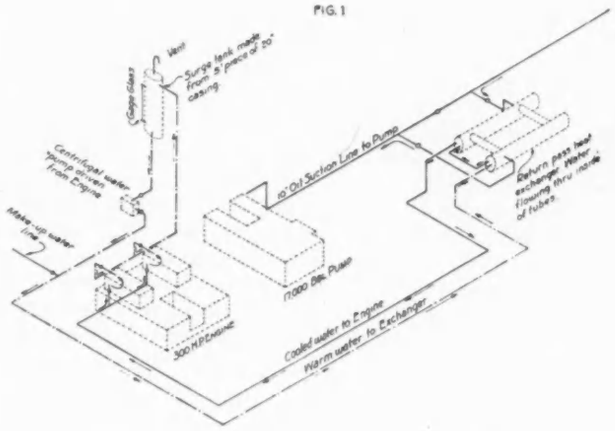
Air chamber and lock in the tunnel. Gauges show pressure on each side of lock

Completed tunnel under Houston Ship Channel looking toward north shaft

Closed Water Systems *For* Diesel Pumping Stations

By FLOYD E. WARTERFIELD, JR.,*
Oklahoma Pipe Line Company

FIG. 1


Vent
Surge tank made from 9 piece of 20" casing
Gage Glass
Centrifugal water pump driven from Engine
Make up water line
To Oil Suction Line to Pump
Return pass heat exchanger Water flowing thru inside of tubes
11000 Bbl. Pump
300 H.P. Engine
Cooled water to Engine
Warm water to Exchanger

SKETCH LAYOUT FOR CLOSED COOLING WATER SYSTEM
TWO EXCHANGERS—PARALLEL CONNECTED

THE theory and general principles involved in the heat transmission between separated fluids in motion, have been known among engineers for a long time. Numerous industries have applied these theories in successful practice and it seems almost incredible that Diesel powered pipe line stations should wait until 1928 to take advantage of such a simple, economic and efficient plan for a water cooling system.

Mr. C. M. Rosebrugh,* Chief Engineer of the Gulf Pipe Line Company, with his associates, so far as can be determined, were the first to apply the closed cooling water system to a Diesel engine pipe line pumping station. A history of their first installation is quite interesting, and the writer believes that their experiences incident to its construction, are quite common to all Diesel stations using the familiar open type gravity system.

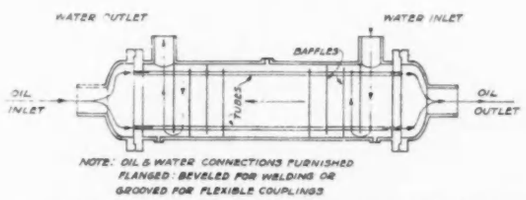
In May of 1928, their Midland station, located in Texas, was operating two 200-horsepower Horizontal Two Cylinder Diesel Engines connected to 12,000-barrel H.D. Power Pumps. The water system consisted of a 20,000-barrel, open storage and cooling reservoir. A gravity feed tank supplied water to the engines and oveflow lines carried this water to the reservoir. A triplex pump, driven from the pinion shaft of each unit, and taking water from the reservoir, served to supply the gravity feed tank. This layout comprised the conventional open cooling water system, so common, in one form or another, to all Diesel pipe line stations.

Water conditions at Midland station finally became so bad that all ordinary methods failed to control the scale forming solids in the water. Maintenance charges for cylinder head replacements, together with the excessive cost and unreliable results obtained from water treatment, made it imperative that something be done to reduce the station operating and maintenance expense.

Accordingly the closed system was tried out as a possible solution to the existing difficulties. The entire plan was based on the theory that only a small quantity of water, from five to 10 gallons, would be circulated through the engine jackets and then cooled in a tube type heat exchanger for recycling. Raw water would be used for the initial charge as well as for make up requirements. Since the quantity of water in the system would be small it was felt that any scale forming solids present would be too small to cause trouble and once these were deposited the softness of the water would increase.

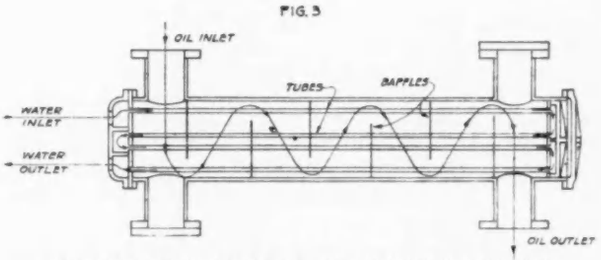
In the original installation each unit was equipped with a Braun, two pass, floating head, horizontal exchanger having five-eighths o.d. tubes and about 200 square feet of cooling surface. The exchangers were placed on the outside of the pump house building and on the engine room

FIG. 2



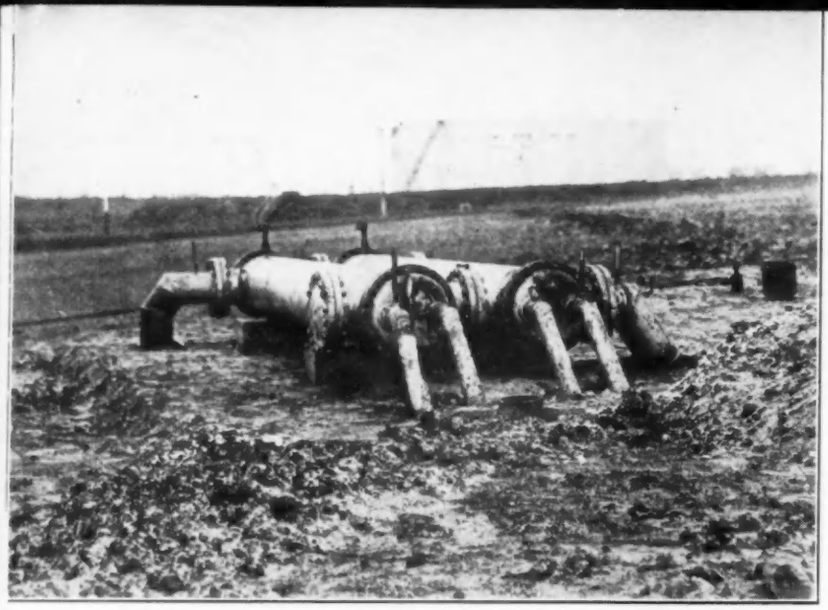
RECENT DESIGN FOR SINGLE PASS-COUNTER CURRENT FLOW EXCHANGER

FIG. 3



EARLY TYPE DESIGN FOR RETURN PASS - MULTIFLOW EXCHANGER

*The writer desires to thank Mr. C. M. Rosebrugh for the generosity with which he has supplied information not otherwise available and without which this paper would be lacking in many details.



Double return pass oil-to-water, heat exchanger, parallel connected.

side. A centrifugal pump, having a capacity of approximately 100 g.p.m. at a 25-foot head, was located in the engine room and belt driven from the main transmission shaft. A small surge tank was constructed on top of the main engine frame between the two cylinders and furnished about seven feet of suction head to the centrifugal pump. The surge tank is equipped with a one-inch gooseneck on top to provide an opening to the atmosphere and with regular gauge glass fittings on the side. The gooseneck connection served as a vent to bring one point in the system to atmospheric pressure, and as a warning against carelessness in charging or a leak in the exchangers. The gauge glass indicated the water line to the station operator at all times. In the cycle of operation, hot water was taken from the bottom of the surge tank to the suction of the centrifugal pump and forced through the heat exchanger on the outside of the tubes, thence through the engine jackets and up into the top of the surge tanks. The vertical triplex pump formerly used in the old system, circulated raw water from the reservoir through the tubes of the exchanger and back to the reservoir, thus carrying off the heat from the closed system water.

This original system will soon be four years old and during this time has consistently kept the cooling water incoming to the engines at about 100° F., for an outgoing temperature of approximately 130° F. Makeup requirements have varied from one to three gallons per week. Up to the present time it has not been necessary to clean or repair the heat exchangers; the engine jackets have never shown any indication of scaling and no cylinder heads have been broken since the system was installed.

A few months operation of this installation was sufficient to indicate its success. In January, 1929, a closed system was installed at Lufkin station and the crude oil pumped by the main unit was used to carry off the heat from the circulating water. This probably marks the first time that crude oil was ever used as the cooling liquid in any heat transfer system. The cycle of operation remained as it was at Midland but several important changes were made. The surge tank was placed next to the fire wall instead of on top of the engine. The exchangers were placed in the pump room and since they were connected into the tank suction line between the tank and pump, the square feet of surface was increased in order to reduce friction losses. This new plan simplified the system and since the raw water pump and its piping system were eliminated, a considerable saving was realized.

The value of the oil-to-water system was soon demonstrated and when three new stations were constructed in March, 1929, closed water cooling system of this type were decided on at the beginning. These installations were made on 400 and 500 horsepower engines driving 25,000 and 35,000-barrel pumps, and were of the same design as the one in operation at Lufkin station.

In June of 1930, one very important change was made in the oil-to-water system and occurred at Sour Lake station where a water-to-water system had been previously installed. A special vertical, combination exchanger and surge tank was in use and raw water conditions were such as to cause large formations in the tubes. This reduced the rate of heat transfer to a point where cleaning was necessary about once every six months. Head from the stock tanks was so low that it was impractical to use a gravity flow oil-to-water exchanger. It was decided, therefore, to try out an installation having small tubes and of the single pass type.

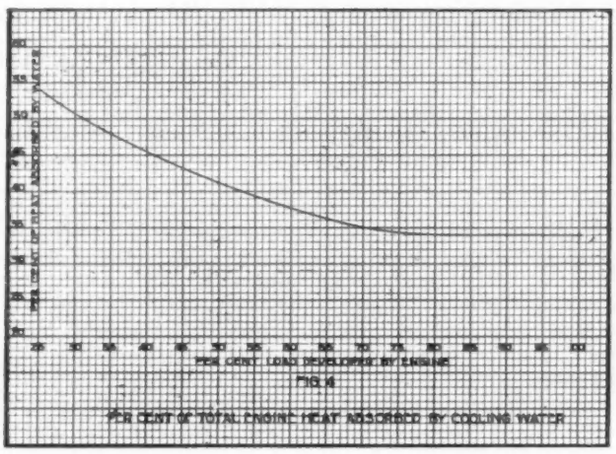


FIG. 6

Oil would be taken from the main suction line and forced through the tubes by means of a low head centrifugal pump. This extra pump was placed on an extended base plate and in line with the water pump in the engine room. Both pumps were connected to a common shaft and driven by belt from the shaft of the main pumping unit. A single pass exchanger was constructed so as to fit inside the pump room. About 400 square feet of cooling surface was obtained by using three-quarter-inch tubes and the entire tube bundle housed in a 16-inch o.d. pipe; the inlet and outlet ends were fastened to the exchanger shell by means of Victaulic couplings. This arrangement proved satisfactory and the system has been in continuous operation without any interruptions in service due to scale formations, either in the tubes of the exchanger or the engine water jackets.

The success of the installation at Sour Lake station, where oil was forced through the tubes and water circulated on the outside by means of a two-pump unit, caused the same type of water system to be decided on for the Gulf Pipe Line Company of Pennsylvania lines, from Tulsa east, and constructed in 1930. The exchangers used for cooling the water to 325 horsepower engines driving 18,000-barrel pumps, have 323 square feet of cooling surface using three-quarter-inch o.d. steel tubes that are housed in a 12¾-

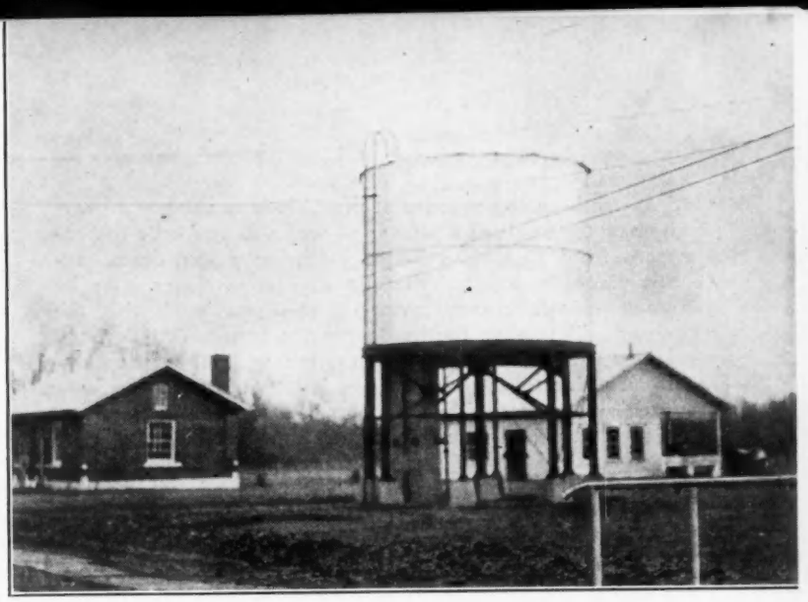
inch o.d. pipe. Stations were constructed in a country where winter conditions are sometimes severe, and it was desirable that the exchangers be designed small enough to be placed inside the pump house building in order to lessen the danger of freezing water lines in case the main pumping unit should be down for any great length of time. A total of 38 cooling units were constructed for stations on the Pennsylvania line and have given complete satisfaction since December, 1930. The makeup water, which is very small, is furnished by the same 500-barrel tank that serves the overall station water system.

From the number of installations that have been made it is obvious that the Gulf Pipe Line Company considers the closed system to be more desirable than the open flow gravity type. That this plan does eliminate many troubles that exist in the open cooling water system, cannot be denied. It does not, however, operate entirely free from troubles of its own. Certain oils are known to be highly corrosive and where they have been used as the cooling medium, some trouble has been had due to the eating out of the exchanger tubes. Unless the exchanger is of good design and well constructed, there is danger of leakage at the tube sheets. Where corrosive oils are used, this difficulty can be almost entirely emilinated by the proper location of the exchanger and the use of flexible couplings for connecting the oil and water lines to the exchanger. Whereas the exchanger system eliminates all scaling troubles, certain instances have been noted where some interior corrosion has taken place. This can be controlled by recharging the system with raw water at regular intervals, or by adding a hardening compound where the water supply is unusually soft. Maintenance costs arising from all of these objections are very low and only a small fraction of those encountered under the old system.

Figure 1 shows the cycle of operation for a gravity flow oil-to-water exchanger system. In this arrangement the centrifugal pump forces the water to the exchanger where it is cooled and returned through the engine jackets to the surge tank. At another installation using similar equipment, the pump forced cooled water through the engine jackets to the exchanger and thence to the tank. If there is any difference in the operation of the two cycles it could not be detected. The only possible exception is that the centrifugal pump may operate at a slightly better efficiency when pumping cold water.

Figures 2 and 3, show two types of exchangers and illustrate the change in design that has taken place. Other things being equal, the type shown in Figure 2, can be constructed for higher pressures at a lesser cost and is primarily intended for use in two-pump, oil-to-water systems. Where this design is to be used in gravity flow lines, the available oil head at low tank gauges and the pressure loss through the exchanger should receive careful attention. If this is not done there is danger of robbing the main pumping unit of just the amount of pressure necessary to make the pump fill properly.

The correct location of the exchanger in a closed system is largely a matter of opinion which depends for the most part on each individual installation. The use of flexible couplings for connecting the oil and water lines will help to relieve the exchanger of external stresses, no matter where it is placed. If located in the suction line to the main unit, a medium pressure design can be used. The tubes should not be made too small or clogging is likely to result and in particular is this true where the tank head



Combination station water supply and exchanger surge tank at a station converted from "open" to "closed" system.

is low. Experience has indicated that, where the oil passes through the tubes, a velocity of four feet per second is required to keep the tubes free from sediment and B.S. accumulations. If made equal to or higher than this rate, the heat transfer is increased and a saving made in the initial design cost. If the exchanger is placed in the discharge line from the main unit then a high pressure design must of course be used. In general, this position is not recommended because not only is the investment increased, but it is the point of high pressure surges and vibration,

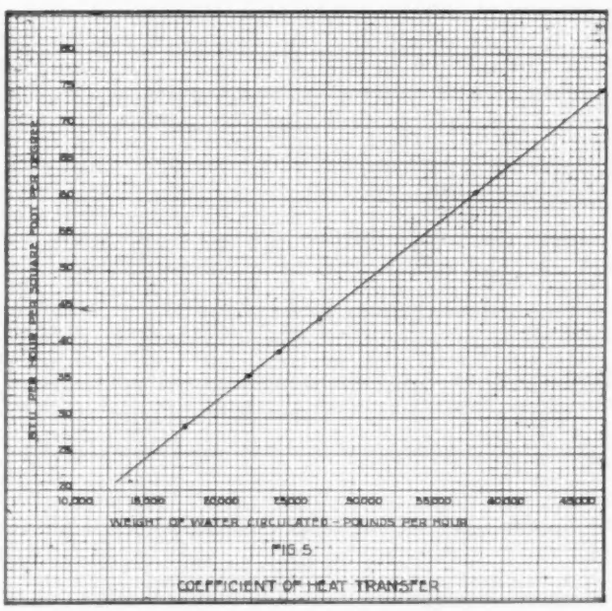
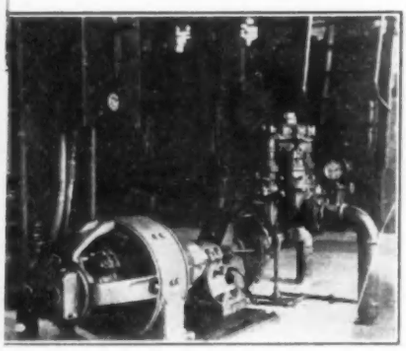


FIG 5

thereby increasing the danger of leakage. It is the writer's opinion that a more economical and satisfactory system will be had when the exchanger is placed in the suction line to the main pumping unit. Each individual installation must determine whether the one or two pump circulating unit is to be used. Each main pumping unit should have its own circulating water system independent of any other unit for the reason that there will be no danger of an entire station shut down due to the failure of the water supply

as would be the case if one exchanger cooled the water for all units.

It has been the practice at most stations using the gravity system to allow a stream of water to run over the engines from 15 to 30 minutes following a shut-down. Instructions have stated that the stream of water is to be small and the reason given for this practice is that the water will remove the heat from the piston, cylinder, and cylinder head to a low temperature without causing distortion, due to one part cooling faster than another. Some such arrangement is no doubt necessary in the open system, but in the writer's opinion it constitutes a serious objection to the use of this system. While it cannot be definitely proven, it is believed that cold water is often passed



Centrifugal water circulating pump.

over the engines at a too rapid rate, thereby causing the condition it is supposed to prevent. The question of how to handle the cooling water in the closed system when the engine is stopped was answered by actual test. It was contended that if the engine was shut down and no attempt made to circulate any water through the engine jackets that the closed system would act as a thermo-siphon system and that the engine parts would be cooled more gradually and effectively than in any other way. The test proved the contention, and as carried out, the rise in the jacket water temperature was from 99° to 130° in 15 minutes. Following this the temperature began to drop slowly and if any damage has ever resulted from this practice it cannot be detected.

Aside from the economy realized through station operating and maintenance costs, the closed system materially reduces the initial investment. This is best illustrated by referring to the actual costs for Station 1, and Station 2. It is possible to compare the installation costs for the open and closed systems at these stations since the price of labor and material was about equal at the time each was built. If it had been possible to install the closed system at the same time the station was constructed the cost could probably have been reduced. As it stands, the comparison is, that the open system cost is about three times that of the closed system. A recent check shows that each could be built at the present time at a lesser cost, and that the ratio of cost would remain about the same.

There is an additional, though perhaps a fine point of economics involved in the use of exchanger systems. When the effect of heating the oil is considered in relationship to the quantity that can be pumped, it is quite probable that there is a definite saving in engine horsepower. This saving can be stated as a function of greater amount of oil that can be pumped at the same pressure as would be required where it not heated, or as the same quantity that can be pumped at a lesser pressure due to the oil being heated. The effect of heating the oil as it passes through the exchanger is of course, manifest in the viscosity. Whether it is considered that the temperature rise is constant throughout the entire discharge line between stations, or that it is some mean temperature rise, does not alter the fact that it exists to some degree. The test reported in Table I, shows that the oil incoming to the exchanger had a temperature of 46° F., and an outgoing of 54° F. This change reduced the viscosity of the oil to such an extent that only 91.5 per cent of the horsepower was required to pump the oil at 54° as would have been required had the given quantity been pumped at 46°. From the indicated 8.5 per cent saving, the horsepower required to circulate the water must be deducted. This amount is small, being only about two horsepower. In the case of the two-pump installation, all of the indicated saving would no doubt be used up in the centrifugal pumps. The point is, that the exchanger system does not appear to increase the horsepower requirements of the station. This cannot be said of the open system because all of the heat lost by the engine and absorbed by the cooling water is lost so far as any useful work in the system is concerned.

Those who would still adhere to the open gravity system and install it on the grounds that their water supply is cheap, unlimited and of good quality, are in danger of making a serious mistake. In open reservoirs, spray ponds and cooling towers, the evaporation losses can easily vary from three to 10 per cent of the volume handled. This loss, of itself, is not serious where water is cheap and plentiful. It must be remembered however, that the water lost through evaporation is pure water, and that the scale forming solids, no mattter how small in amount, remain in solution in the system. As makeup water is added, concentration is bound to occur. Finally, a system which was originally safe, becomes so heavy with solids as to cause scale formations in the engine jackets. Scale removing and water treating compounds must then be used with the result that the station operation and maintenance costs are increased.

In order to select heat exchangers and pumps of the correct design it is necessary to determine the amount of cooling water required for individual engine operating conditions. One convenient formula in general use and reported

STATION NUMBER ONE

Installed Cost of Open Type, Gravity Cooling Water System.

Constructed in August, 1924.

Reinforced concrete reservoir. Approximately 95,000 barrels storage capacity	**$ 9,382.25**
1,000 Barrel bolted steel water tank	**1,221.07**
Steel water tower foundation	**811.89**
Line Pipe, Fittings, Incidental Material and Labor of Connection Work	**1,585.00**
Total	**$13,000.21**

The above installation is the conventional type commonly found at main line pumping stations. This system furnished the water supply for the Auxiliary Equipment and two 400 H. P. Four Cylinder Vertical De La Vergue Engines connected to Goulds 6¼ x 24, 23,000 bbl. pumps. One unit operating. One unit as standby.

STATION NUMBER TWO

Installed Cost of Exchanger Cooling Water System to Replace Open Type Gravity System. Constructed January, 1930.

Two—400 Sq. Ft. Return Pass, Water to Oil Heat Exchangers	$ 1,623.18
Line Pipe	290.39
Valves, Flanges and Fittings	511.80
3 x 12 Single Stage, Horizontal Belt Driven Centrifugal Water Pump	118.00
Pulley, Belting, Surge Tank, Supports, etc.	180.70
Thermometers, Pressure Gauges, and Water Meter	105.92
Concrete Work, Miscellaneous Material and Incidental Expense	306.79
Labor of Installation	1,440.03
Total	$ 4,567.81

Constructed to replace conventional gravity system, substantially the same as given for Station No. 1, and to supply cooling water to one 300 H. P. Two Cylinder, Horizantal De La Vergue Engine connected to National Transit 5½ x 24, 17,000 bbl. pump.

by Morrison,[1] gives the weight of water required per horsepower hour.

$$W = \frac{x\,H}{100\,(t_1 - t_2)} \qquad (1)$$

where:

W = Weight of water required per H.P. Hr.
x = Percentage of heat absorbed by the water.
H = Total heat supplied to the engine per B.H.P.
t_1 = Discharge water temperature.
t_2 = Intake water temperature.

In applying the formula it is of course necessary to know t_1, for the operating condition of the engine and this is best obtained from the manufacturer. Where this value is not definitely known it can be assumed from 115° F., to 130° F. Although engines have been safely operated at temperatures higher than 130°, the practice is not generally recommended. Outlet temperatures less than 115° should be avoided so far as possible for the reason that a greater quantity of water must be circulated to maintain the engine at this temperature than when higher values are used. Most engines do not run smoothly when the outlet water temperature is low and the point of best operation is usually found for temperatures ranging from 120° to 130°.

In choosing t_2, care must be taken not to make it too small. Since the difference between t_1 and t_2, is the B.t.u.'s., each pound of water will absorb, it is evident that the greater the difference, the smaller the amount of water required. There is a practical limit to which this can be carried and under all ordinary conditions should not exceed 50°. This difference can be regarded as the temperature rise in the engine or as the drop in the exchangers. Since we are interested in the heat transfer that takes place within the exchanger, the difference will be regarded as the temperature drop; t_1 and t_2, must therefore be reversed in meaning.

t_1 = Temperature of water incoming to exchanger.
t_2 = Temperature of water outgoing from exchanger.

That amount of heat which is lost through radiation and conduction in the piping system cannot be predicted with any assurance and is therefore disregarded.

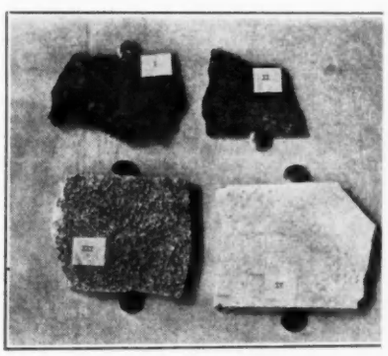
The percentage of total heat, x, supplied to the engine, that is absorbed by the cooling water is a function of the individual engine. An analysis of a large number of heat distribution tests, furnishes a good basis for determining the amount of heat lost in this way. Figure 4 has been prepared as representative of average values for various engine loads. This curve is not intended to be absolutely accurate for all engines but it is believed that its use will give results within the limits of allowable error.

The total heat, H, depends upon the grade of oil used for fuel and its average heating value in B.t.u.'s per pound, as well as the economy of the engine under given load conditions when using this fuel. For example, if the engine has an economy of 0.48 pound of fuel per B.H.P. at 50 per cent load when using an oil having a heating value of 19,000 B.t.u. per pound, the total heat supplied per B.H.P. is 9120 B.t.u. The percentage of heat absorbed by the cooling water, from Fig. 4, is 41.

In order to test the dependability of the formula the amount of water per B.h.p. was computed, using the actual temperature drops as shown by the observed test data in Table I. The weight of water actually used per B.h.p. was determined from the observed test data and these two results are given in Table II. A comparison of these figures shows that they are in agreement, sufficient for all practical purposes.

It is obvious that the values of the variables in Formula (1), must either be known or assumed, and in this connection the manufacturer can be of material assistance to the purchaser by furnishing this data in detail. It is entirely possible that it has been furnished and not used, or that neither the purchaser nor manufacturer have considered the matter to be important. In any event, these values must be carefully determined if heat exchangers are to be designed and used to the best advantage.

Centrifugal pumps are more satisfactory for handling the cooling water in exchanger systems than those of the piston type and are recommended for this service. The most frequent mistake made, is that of selecting a pump that has a capacity much greater than is actually required for the low head at which it operates. In the centrifugal pump the head-capacity characteristics can be controlled over a wide range by merely throttling the discharge. This gives a factor of flexibility to the system that is very desirable under varying engine load conditions. Some form of enclosed, lubricated stop for controlling the rate of flow, is preferable to the wedge type gate valve for the reason that regulation is positive and quick. The most serious objection that can be raised against the use of the centrifugal pump is that it must be made self priming. Since the surge tank is always placed several feet above the pump suction, this objection is overcome.



I. Scale from engine jackets, with surface in contact with metal, after 4000 hours, thickness 1⅛8 inch.

II. Same as I., surface in contact with water.

III. Scale from reservoir, contact with water, accumulated over 7½ year period, thickness ⅛-inch.

IV. Same as III., in contact with concrete.

Opinions differ somewhat as to the best method for driving the circulating pumps. The writer favors the plan whereby each main unit drives its own circulating pump direct from the main transmission shaft, either by means of a chain, gears or a combination drive. In this way water circulation begins as soon as the engine starts. There is ordinarily less chance of pump failure on direct drives than where the pump must depend on a secondary source of

[1]American Diesel Engines; L. H. Morrison, McGraw-Hill Co., 1931.

power. A standby pump, either motor or auxiliary engine driven, and manifolded to the entire water system should be installed at multi-unit pumping stations. This provision will guard against the danger of having a main pumping unit out of service due to the failure of its circulating pumps.

The coefficient of heat transfer curve shown in Figure 5, has been prepared from the observed test data given in Table I. This curve will doubtless possess different characteristics for different types of exchanger design. That it is correct for the one particular exchanger on which the test was made, is all that is claimed. Check computations using coefficients from this curve for determining the square feet of cooling surface in single pass counter-current exchangers gave results that were quite accurate. In using this curve it is first necessary to compute the weight of water to be circulated per hour for a given temperature drop, which can be done by means of Formula (1). Knowing this rate the proper coefficient can be selected. The quantity of heat carried away from the engine in B.t.u.'s per hour is easily computed and by simple division the number of square feet of cooling surface obtained. It is to be hoped that further tests will be made on actual installations and similar curves prepared in order that the detail of the more widely known formula can be simplified. A check of a number of exchanger installations shows that the cooling surface required per H. P. Hr. under widely operating conditions ranges from 0.75 to 1.25 square feet with a fair average at about one square foot. Those desiring a more theoretical discussion on heat transfer systems are referred to Lucke-Engineering Thermodynamics. The quantity of heat given up by the water, neglecting losses, must be equal to the heat carried away by the oil. For a given temperature rise in the oil, the amount necessary to carry away the heat of a given temperature drop in the water can be computed from the formula, that

$$W_o = \frac{C_w W_w (t_{w1} - t_{w2})}{C_o (t_{o2} - t_{o1})}$$

where

W_o = Weight of oil in pounds per hour.
W_w = Weight of water in pounds per hour.
C_o = Specific heat of the oil.
C_w = Specific heat of the water.
t_{o1} = Initial temperature of the oil.
t_{o2} = Final temperature of the oil.
t_{w1} = Initial temperature of the water.
t_{w2} = Final temperature of the water.

The large number of exchanger systems that have been installed and successfully operated during the past four years have done much to remove the element of doubt from the minds of many pipe line officials and engineers alike. The idea is no longer in the experimental class, but is firmly established as a thoroughly workable plan, which economically solves many of the troublesome problems that exist under the open gravity system.

There is little to indicate that the present interpretation of the fundamental plan will undergo any radical changes in the future. It is reasonable to expect that development will be along the lines of refinement in design, increased efficiency and economy, and will be brought about by a larger number of installations at pipe line pumping stations.

TABLE I

TEST OF CLOSED COOLING WATER SYSTEM UNIT NO. 2 FRANCIS STATION

Test Conducted by: J. M. Bradley
F. E. Warterfield, Jr.

February 2nd, 1932.

AVERAGE OF TEN MINUTE TEST RUNS

Test Number	Temp. of Water in Engine Cylinders	Rate of Water Flow		Rate of Oil Flow		Water Temperature		Temp. Drop	Oil Temperature		Temp. Rise	Pressure at Discharge of Cent. Pump	Atmos. Temp.
		G.P.M.	Lbs.	G.P.M.	Lbs.	Into Exchanger	Out of Exchanger		Into Exchanger	Out of Exchanger			
1	104.0°	93.4	778	501	3624	96.5°	79.0°	17.5°	46.0°	54.0°	8.0°	38.0#	69°
2	108.0°	76.0	633	520	3761	100.0°	79.5°	20.5°	46.0°	54.0°	8.0°	32.0#	68°
3	112.5°	54.3	452	495	3581	105.0°	77.0°	28.0°	46.0°	54.0°	8.0°	21.0#	67°
4	117.0°	48.8	406	516	3734	109.5°	77.5°	32.0°	46.0°	55.0°	9.0°	18.5#	66°
5	121.0°	44.5	371	499	3609	114.5°	78.0°	36.5°	46.5°	55.5°	9.0°	17.5#	65°
6	128.5°	35.8	298	516	3733	118.0°	75.0°	43.0°	46.5°	55.5°	9.0°	15.0#	64°
7	128.0°	35.8	298	518	3747	119.5°	76.0°	43.5°	46.5°	55.5°	9.0°	15.0#	64°

Note—Oil pressure at outlet from exchanger remained practically constant at 4.5#.

Heat Exchangers consisted of Two return pass multi-flow Units having 1" O.D. seamless steel tubes, set horizontal and connected in parallel. Each Unit has approximately 312 sq. ft. of cooling surface. Water flows through inside of tubes. Furnishes cooling water to one 400 H.P. Four Cylinder Vertical De La Vergne Engine connected to Goulds 6¼x24 H.T. 23,000 bbl. Pump.

TABLE II

QUANTITY OF COOLING WATER REQUIRED PER B.H.P.

Data obtained from same test as reported in Table I **Computed from Formula (I)**

Test Number	Rate of Water Flow		Rate of Oil Flow Bbls. Per Day	Pumping Pressure	B.H.P. Load on Engine	Per Cent Full Load on Engine	Per Cent Heat Absorbed By Water	Pounds Water Per B.H.P.	Pounds Water Per B.H.P.
	G. P. M.	LBS.							
1	93.4	778	17,174	692.5	243.6	60.9	37.5	192	180
2	76.0	633	17,830	697.5	254.6	63.6	36.5	149	148
3	54.3	452	16,978	697.5	242.5	60.6	37.5	112	112
4	48.8	406	17,698	700.0	253.7	63.4	36.5	96	95
5	44.5	371	17,107	700.0	245.2	61.3	37.2	90	85
6	35.8	298	17,698	700.0	253.7	63.4	36.5	70	70
7	35.8	298	17,765	700.0	254.7	63.6	36.5	70	70

Note—The average engine economy was assumed to be 0.45 pounds per B.H.P. when using an oil having an average heating value of 18,500 B.T.U. per pound. The mechanical efficiency of the pump was assumed to be 83%.

Exchangers were two double return pass, connected in parallel and having a total cooling surface of 624 square feet. Water flows through the tubes and one half of the flow is "parallel" to the cooling oil stream and one half "counter current".

Meeting The

"Evils" of River Crossings

On Three Mississippi Lines

By J. T. ENGLISH,
Superintendent Pipe Line Maintenance, Prairie Pipe Line Company, Northern Division

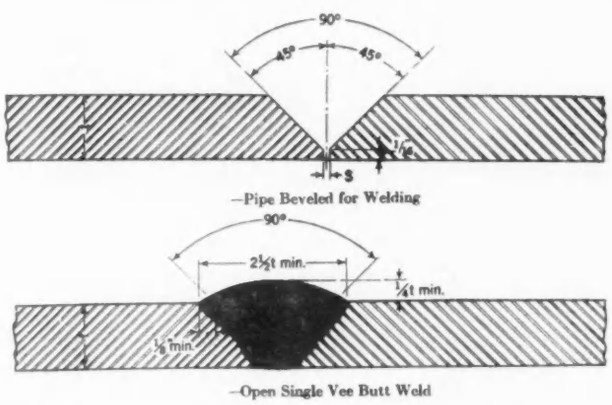
WITH a few exceptions, overland pipe lines follow the elementary geometric axiom that a straight line is the shortest distance between two points; and a pipe line, if extended far enough, will sooner or later meet a river, the crossing of such becoming a necessary evil. The term "evil" is used advisedly since the crossing of major streams necessitates the diverging from our highly organized method of overland laying and substituting therefor one of several rather specialized techniques, the choice of which depends upon individual conditions. During the past five years, we have had occasion to lay three groups of oil pipe lines across the Mississippi River. Due to particular conditions prevailing for each crossing, we have used in each instance, a different method. The purpose of this paper is to discuss these crossings and to point out the relative merits of each with respect to speed of laying, cost, and seasonal influence.

All three of these crossings employed the use of oxy-acetylene welding, and the writer proposes first to discuss briefly the type of joint used, together with comments on the matter of weld reinforcement. All of our work, up to the present time, has made use of the Ripple type of welding and we have standardized upon this type of oxy-acetylene welding because our overland pipe line experience has shown it to be practically a 100 per cent strength joint. New developments are under way in the province both of electric and gas welding, and in view of these developments, we would not want to go on record as saying that our next major river crossing will not take cognizance of these developments.

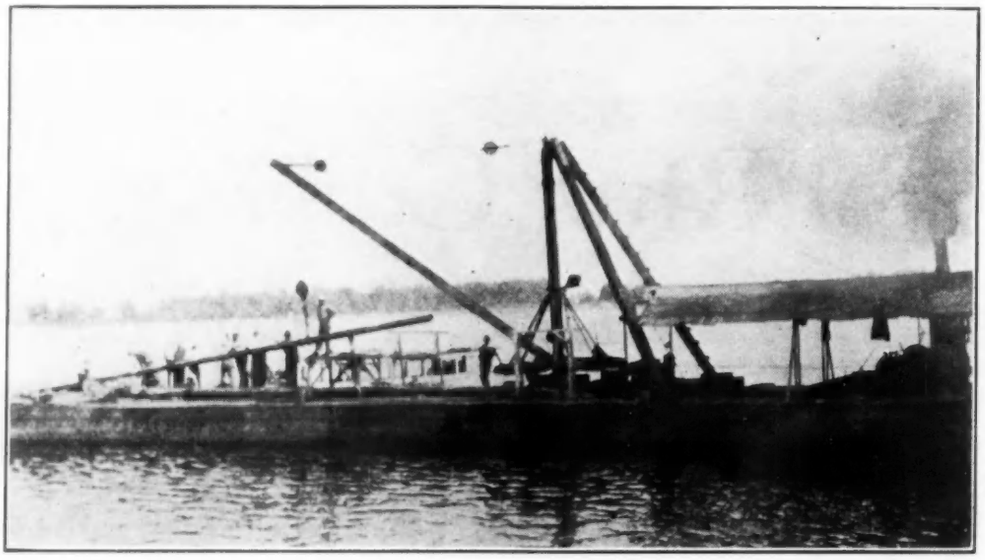
With regard to the design of the joint itself, on two of the crossings, we used what is commonly known as the straight single "V" butt joint. On the third crossing we made use of a double bell and chill ring butt joint, for the purpose of comparing this type of jointure with that previously used. In this latter type of joint, the line itself being 10¾-inch O.D. pipe, the ends were belled to an outside diameter of approximately 12 inches, the flat portion of the bell extending about four inches on each side of the weld. An eight-inch wide heavy liner was inserted within the belled end to provide a backing up of the weld and to act in some measure as a reinforcement against bending.

With regard to weld reinforcement, it is the commonly accepted practice today to employ some sort of reinforcement for river crossings. This reinforcement resolves itself into two general types: Sleeve type and strip type. The former type employs a sleeve having an inside diameter slightly larger than the outside of the pipe, and this reinforcement ordinarily requires the river pipe to be flush welded or bent to correspond to contour of girth butt weld. Upon completing the river pipe weld, the sleeve, which may have a length of from two to four feet, is centered over the weld and fillet welded at each end. The argument favoring this type of construction points out that in order for the river pipe weld to leak, at least two of the three welds must be at fault. Our experience has been confined solely to the strip type of reinforcement, which involves welding strips of steel ½ inch by one inch by six-inch to eight-inches long over and at right angles to the girth weld. We have never had a defective weld of any consequence on any of our crossings and feel that strip reinforcement is adequate protection at a relatively low cost.

The question is frequently raised: "Why use any rein-



Single Vee type joint used on section of eight-inch line across Mississippi River at Wood River, Illinois, and later at crossing near Fort Madison, Iowa.



Barge method for laying gas welded line on Mississippi crossing at Wood River, Illinois

forcement if the gas welded butt joint has a 100 per cent strength?" We believe, and our experience has shown, that a properly executed weld has a strength at least equivalent to the pipe being joined. However, there are extenuating circumstances applying to river crossings which are not of such moment with regard to land lines. The unreinforced butt weld is probably satisfactory for crossings but when we consider the possibility, although it may be remote, of a joint failure, with its attendant interruption in service and its extremely high cost of repair, the slight additional cost of the welding strips, we feel, is more than justified. Furthermore, there are, no doubt, contour conditions present in a good many cases which will impose rather severe stresses upon the line. Ordinarily, no cognizance is taken of these conditions during a river crossing, although in land lines they are given due consideration and handled accordingly.

It is rather difficult to compare the cost of one river crossing as against another, since modifying circumstances are seldom twice the same. Before considering in detail the three types of crossings to be discussed, the writer would like to point out some of the factors influencing cost. Dealing first with minor items, the following will probably apply regardless of whatever technique is employed in actually laying the line:

1. Dredging, either at the approach to the river or upon the bottom.

2. Shallow water conditions interferring with the movement of the barges, and or necessitating the use or non-use of river clamps.

3. Wind and weather.

These elements are secondary to the major items of cost; that is, the purchase price of the pipe itself and the expense incidental to the actual laying of the lines, the latter varying considerably, depending upon the method employed. The purchase cost of the pipe is the largest single, individual item of expense amounting in general to from 50 to 55 per cent of the entire cost of the job and the laying cost, approximately from 25 to 40 per cent of the total. The technique of laying is, in substance, the only element of the total cost which falls to an extent at least, within our control and is directly concerned with the method employed.

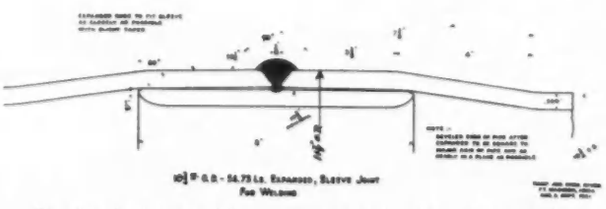
With these remarks as a preamble, the writer shall endeavor to describe three separate and distinct methods which The Prairie Pipe Line Company has made use of for the crossing of a major stream, summarizing the advantages of each, together with the way in which they reflect upon the total cost of the job.

Conventional Barge Method

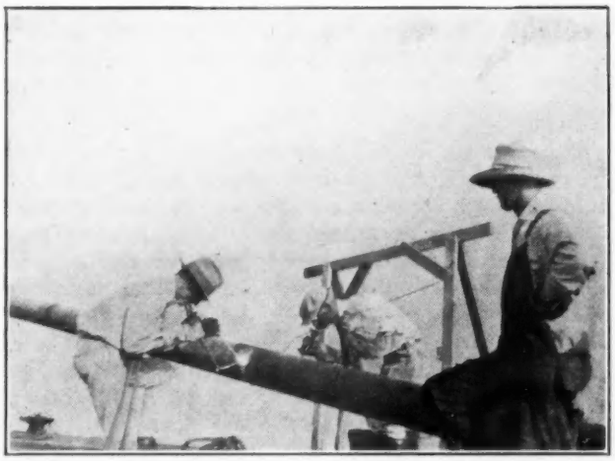
There is no particular novelty in the laying of a pipe line across a major stream. This has been done by several companies any number of instances in the past. However, to our knowledge, only one or two lines utilizing welding for joining the pipe, were laid across a stream of major importance prior to the time The Prairie Pipe Line Company laid an eight-inch line across the Mississippi at Wood River, Illinois, in 1927. We believe this marks one of the earliest ventures in a gas welded line for a major crossing. Our experience with crossings prior to that date had been confined solely to screwed lines, and when it was proposed to apply welded construction to the above crossing, we were naturally ultra conservative. The method employed was nothing more than an adaptation of the method used with screw coupled lines, in which the laying was from a single barge. This method is, no doubt, familiar to you, so the writer will reserve detailed description for the two methods later employed. Some statistical data, however, may be of interest. The river at this point was approximatly one-half mile wide and the eight-inch pipe was laid in 40-foot random lengths. Naturally, extreme precaution was taken during welding and care was exercised in securing as welders only those men whom we knew from past experience were capable of putting in a 100 per cent strength joint. The welding at all times was carried on under exacting supervision and it may interest you to know that on this first venture we laid only approximately six joints per day. As would naturally be anticipated, our cost of laying was unduly high; however, our confidence in and experience with this type of joint, would today be reflected in a much lower cost, with similar equipment.

Crossing the River on Ice

During the summer and fall of 1929, the trunk lines of our northern division were being operated to their maximum ca-



Double bell and chill joint ring joint for 10-inch pipe.



Gas welding on conventional barge for Mississippi crossing at Wood River, 1927.

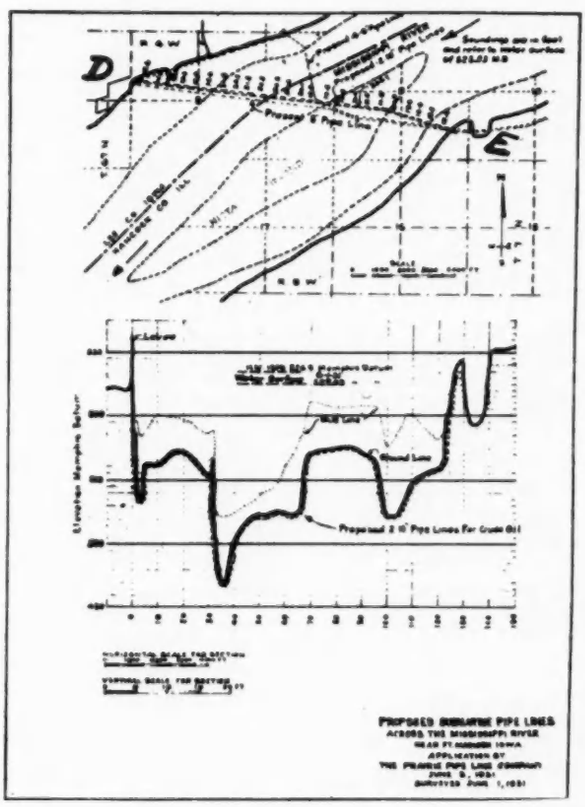
pacity and the desirability of laying additional lines was recognized, but it was not until December that work could actually be undertaken. One of these eight-inch lines extended from the Ft. Madison, Iowa, pump station to a point approximately 10 miles east. This location necessitated the crossing of the Mississippi River, which at this point is approximately 2½ miles wide, due to the backwater of the Keokuk dam, located 20 miles south and downstream from Ft. Madison.

Due to the approach of cold weather, we realized that to lay this line from barges would be not only an expensive process, but would be fraught with considerable danger because of ice on the river. It became apparent that if this line was to be laid before spring, we would have to make the crossing on ice. During the interval between the laying of the line at Wood River, which has just been described, and the contemplated line, we had been using the gas welding process exclusively on all of our land lines; and during this time our familiarity and experience with this process and our belief in it as a method of pipe jointure, confirmed our belief that the laying of a gas welded line across the river on ice at Ft. Madison would prove to be both satisfactory and economical.

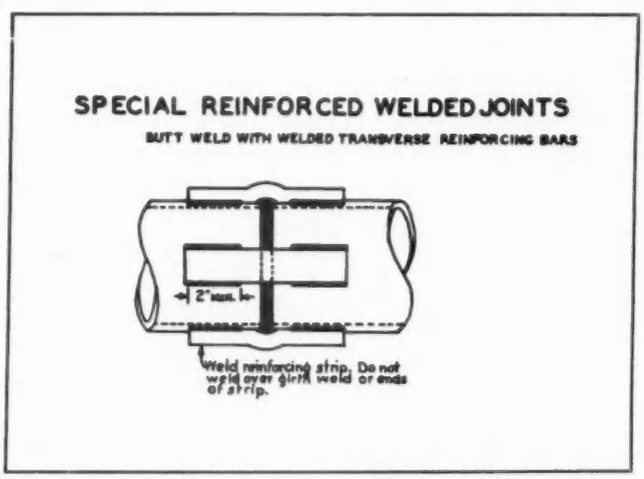
The actual stringing of pipe was delayed until the latter part of January, 1930, at which time the ice was from 10 to 12 inches thick. There was from four to six inches of snow on top of the ice which retarded freezing, and this snow was removed along the line of our contemplated activity in order to increase the ice thickness and add to the safety of our operations.

The eight-inch pipe was strung and laid by the usual method used on land, and as naturally would be supposed, considerable care was exercised and due consideration was given to the danger of breaking through the ice. In order that no undue hazard would be overlooked, we employed the services of an ice superintendent, a man who had had considerable experience with ice and as a result of such experience was in a position to know definitely the extent of the hazards involved. Excessive loading of the trucks was guarded against, and the loaded trucks were routed over a wide area. In fact, all of our operations in connection with the laying of this line were spread over as large an area as was practicable.

Since the line was laid on a practically level surface, and the profile of the river bed was irregular, provision had to be made for slack, so that there would be sufficient pipe for the line to adjust itself to the river bed after lowering. Soundings were taken at regular intervals across the river and from these measurements the amount of horizontal slack was calculated. Extremely low temperatures prevailed throughout the course of construction, the temperature varying from zero to 25 degrees below, which complicated matters slightly. We started out using generated acetylene, but changed to cylinder acetylene for the added convenience of dissolved acetylene in



Plan and profile of the Mississippi River at Fort Madison, Iowa, for the eight-inch ice welding job. Route taken was the direct line from D to E.


SPECIAL REINFORCED WELDED JOINTS
BUTT WELD WITH WELDED TRANSVERSE REINFORCING BARS
2" min.
Weld reinforcing strip. Do not weld over girth weld or ends of strip.

Strip type of reinforcement for welded joints for stream crossings.

Lowering eight-inch line into Mississippi River after completing line on ice in January, 1930..

the face of these adverse weather conditions. Because of our exposed position, we rigged up portable shelters for the welders made of corrugated sheet iron open on one side, and provided with handles so that they could be easily moved from one location to another. We were agreeably surprised to find that notwithstanding weather conditions, the speed of welding was not materially decreased. In spite of the low temperature, the increase in welding cost amounted to probably not more than 10 per cent over what we could expect under summer weather conditions.

The conventional laying organization and the same sequence of operations which would be used on a land line, were applied on this crossing.

The entire length of the 2½-mile crossing was welded, and river clamps put in place before the actual lowering of the line was undertaken. (Would like to mention at this point that river clamps, in all of our crossings are not used in any sense as a reinforcement of the weld, but are used merely to weight down the pipe.) We were not particularly concerned with the hazards during the stringing and welding of the line but did take extra precaution with the operations involved in lowering the line through the ice. On the lowering-in gang, the men worked in pairs tied together with ropes, and we also avoided grouping of men and equipment as much as possible. We thought ourselves pretty well able to cope with any emergency and it may interest you to know that we had no serious accidents during the entire crossing.

Ice plows pulled by horses, were used to cut the ice about two feet on each side of the pipe line and hand saws were used occasionally to finish the cutting, if the ice happened to be too thick for the plow. The line was lowered with derricks and pipe windlasses, but these were used merely to lower the line down gradually, as the weight of the pipe itself was sufficient to break and push down the cut strip of ice. The entire construction period, beginning with the stringing of the 2½ miles of pipe and ending with the lowering of the line into the river, covered 10 days.

The Ramp Barge Crossing

The generally accepted method of laying river crossings when barges are employed has been to weld and lay a single line in one operation, and if more lines are to be laid, to repeat the first operation until the required number of lines is completed. We departed from this method of construction in our third Mississippi River crossing, put in during August and September, 1931. This crossing, at Ft. Madison, Iowa, was novel in that it made use of a ramp method in conjunction with the laying of two lines simultaneously.

The distance across the Mississippi River at Ft. Madison is approximately 2½ miles, the lines crossing two channels and one submerged island. River clamps were used on such pipe as lay within the main channel, the dead weight of the pipe itself being sufficient for the back water areas. Both lines were 10¾-inch outside diameter with a ½-inch wall thickness, weighing 54.7 pounds per foot, the pipe being in 40 feet random lengths. On this crossing we departed from our usual practice of employing the straight single "V" butt type of weld and used instead a double bell and chill ring type. In this instance, as with the other crossings, the straight butt weld was used with no failures whatsoever; and our employment of the double bell and chill ring joint for this crossing was an endeavor on our part to find out through actual application whether this type of joint had any advantages over that which we have previously used. We felt that possibly some benefit in line-up would be derived from the liner and, further, that it would act in a measure as an increased support to the joint to withstand bending stresses. Our conclusions with regard to this design were that, although the chill rings may minimize a stress concentration at the weld, due to bending, nevertheless, the strip type of reinforcement is more than ample to take care of any ordinary river bottom conditions. Further, the chill ring itself does not aid materially in line-up of the pipe, but instead does retard the welding speed appreciably; and, obviously, the increase in diameter due to the belling operation necessitates the making of a weld in 10-inch pipe which is nearly equivalent to what would be made in straight end pipe having a diameter of 12-inch.

In order to reduce the number of welds necessary to be made on the barge, the 40-foot random lengths were double lengthed into 80-foot random lengths by welding a sufficient amount for both lines. This operation was carried out on the bank of the river, acetylene being supplied from portable generators. While double lengthening was in progress, work was proceeding on the floating equipment, preparatory to the actual river crossing. The principal floating equipment used in this crossing consisted of the following units: One 80-foot pipe transport and storage barge, two 110-foot laying barges, one power barge equipped with boom and steel winches, and one Diesel engine driven stern wheel tug. The laying barges were lashed together end to end, thus giving a working deck area of 24 feet by 220 feet. Upon this deck an inclined ramp was constructed using for the purpose junk eight-inch pipe. The high end of the ramp was slightly more than 22 feet above the deck, the incline from this elevation making an angle with the deck of about seven degrees. During the greater part of the crossing, the angle of sag of the pipe as it was fed off the barge did not greatly exceed this amount; which meant that there was but a very slight bend imposed upon the lines as they left the rails on the ramp. On the top cross members of the ramp, two tracks were constructed of 30-pound rails, which were welded parallel to each other running practically the entire length of the ramp. The rails for each line were spaced to accommodate a 10-inch river clamp. Wood floors and guard rails were placed along the length of the ramp top at points where labor activities were concentrated.

The sequence of laying operations was as follows: In the beginning, three 80-foot lengths of pipe were placed between each pair of rails and four oxy-acetylene welders,

two men to each joint, completed the two welds at the lower end of the ramp. When these welds were completed, reinforcing straps were welded over the joints by electric arc welding. The gas welders then moved forward on the ramp and completed the two remaining open joints. Upon completion of the welding, barges were ready for their first move. A rather novel means was used in assisting the moving of the barges across the river. With the two lines riding between the rails, a cable from a tractor winch, located at foot of ramp was run along to the high end where it was attached to the end of the welded pipe lengths. Thus, when power was applied to the winch, the barges pushed themselves along, using the lines which were being laid as barge poles. This movement was occasionally assisted by a steam winch operated from power barge, when barges were in shallow water and riding on mud.

When, by this method, the barges had been moved a distance of 80 feet, the last completed welded joint was brought into position for the application of the reinforcing strip and the placing of two more 80-foot lengths of pipe. This procedure was repeated at the completion of each pair of gas welds and you will note that the set up was such as to prevent loss of time in welding on the reinforcing strips and, later, of bolting on the river clamps when we reached the channel.

It required approximately 60 minutes for the two welders, both working simultaneously, to make the one acetylene weld on this 12-inch outside diameter double bell joint. Lost time between welds, which included moving the barges a distance of 80 feet and placing of two 80-foot lengths of pipe in position for welding, required about 10 minutes. The actual laying time for the five miles of pipe was 15 days. One day was lost on account of extremely rough water. When we were considering this method of laying, some doubt was entertained whether or not it would be practical to attempt lashing together two barges with a ramp common between the both of them, from the viewpoint that rough water would cause a relative motion between the two barges which would interfere with the welding operation. During this laying we encountered fairly rough water, but at no time were conditions bad enough, except for the one day, in which it was necessary entirely to suspend operations.

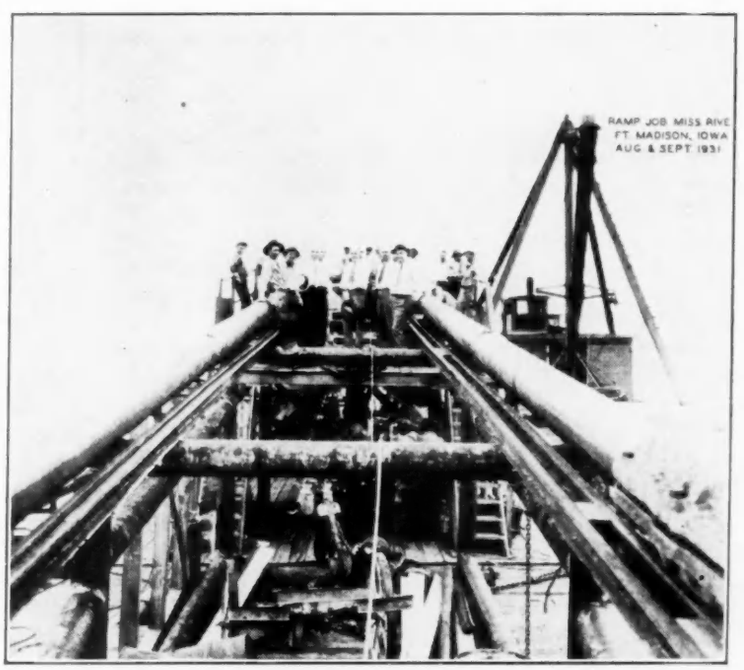
Summary

As mentioned previously, with the exception of the purchase cost of the pipe, the largest individual expense incidental to a river crossing was the cost of laying. In view of the fact that the three lines which have been described employed in each instance an entirely different method, the writer would like to summarize briefly the particular advantages of each method.

From the standpoint of laying cost, the ice crossing was the cheapest of the three. We should naturally expect this, because our field organization and laying methods were substantially the same as we apply in land practice. A further advantage which applies only to this method is that it may be subjected to the full working pressure, and any leaks noted and repaired before lowering. Although a crossing laid under such conditions might appear to be extremely hazardous, our experience has lead us to believe that there is no particular danger involved so long as ordinary precautions are taken. It is probably true that the particular province of the ice job applies only to a single line. Obviously for multiple line crossings, there would be considerable difficulty in applying this method—particularly since rather extreme hazard would be involved when the ice had been cut to lower one line, which would naturally tend to weaken the ice for further operations in lowering a second or third line. Two limitations must be placed upon this method; first, if any dredging is required, obviously the ice crossing is out of the question, and second, the ice crossing naturally can only be made during the winter season, which may not be in line with the pipe laying program.

It is in the laying of multiple lines that the ramp method holds out interesting possibilities of reducing costs as compared to conventional barge laying. This is possible through the simultaneous laying of two or more lines. The overhead on floating equipment may easily amount to several hundred dollars per day, which factor will more than justify the expense incidental to the construction of the ramp. Furthermore, if particularly deep water conditions are encountered, the ramp method, since it allows the pipe to leave the barge at an angle, will impose less bending stress upon the line during laying than would be the case with the conventional barge method. In applying the barge method, whether the ramp construction is employed or not, we strongly endorse lengthening the pipe into sections as long as permissable prior to undertaking the actual laying of the line. The barge welding must necessarily be of bell-hole type, since it is not possible to rotate the pipe during welding. However, on the double lengthening operation, the pipe can be rotated with a considerable saving in welding cost.

In closing, the writer would like particularly to pay tribute to the welding industry which, through its constant research and improvements in welding methods, has made it possible to effect a reduction in pipe laying costs. Speed of laying these pipe lines was principally dependent upon the speed of welding and with the more efficient methods for welding already developed, and in process of development, future laying costs undoubtedly will still further be reduced.



Details of ramp barge construction. Rails used for slides and eight-inch junk pipe for construction of ramp.

Interesting Problems In Repairing

By J. J. BOYD

IT is most likely that every leak repair in a large river would present a different problem. The writer has had experience with only two such jobs and this paper will be confined to a discussion of these two.

First: The repair of a small leak in the Stanolind Pipe Line Company's No. 1 eight-inch line in the Mississippi River a short distance below Fort Madison, Iowa.

This company has three eight-inch lines and one 12-inch line crossing the river at this point. During the late spring of 1931 a small oil leak in one of these lines was reported by the employes of Prairie Pipe Line Company. By triangulation this was found to be the No. 1 eight-inch line and this limb was shut out of service with the result that considerably less oil was found on the water.

Since the No. 1 line is a screw line laid in 1917 and Prairie Pipe Line Company had reported considerable trouble with pit leaks in its lines a short distance above, it was decided to repair the line with a stuffing box which would be satisfactory for either a pit or a collar leak. Due to the dam at Keokuk, Iowa, about 15 miles below the pipe line crossing, Fort Madison has practically the same water elevation the year round. Soundings indicated that the top of the pipe line at the leak was 19 feet below the water surface with about one foot of sand over it. Under these conditions the best method of placing the stuffing box on the line was to dredge the sand away from the line and have a diver put on the box.

The following equipment was rented for this work;

One 75-H.P. Diesel towboat.

One sand barge for a material and work barge.

One steam powered eight-inch centrifugal suction dredge.

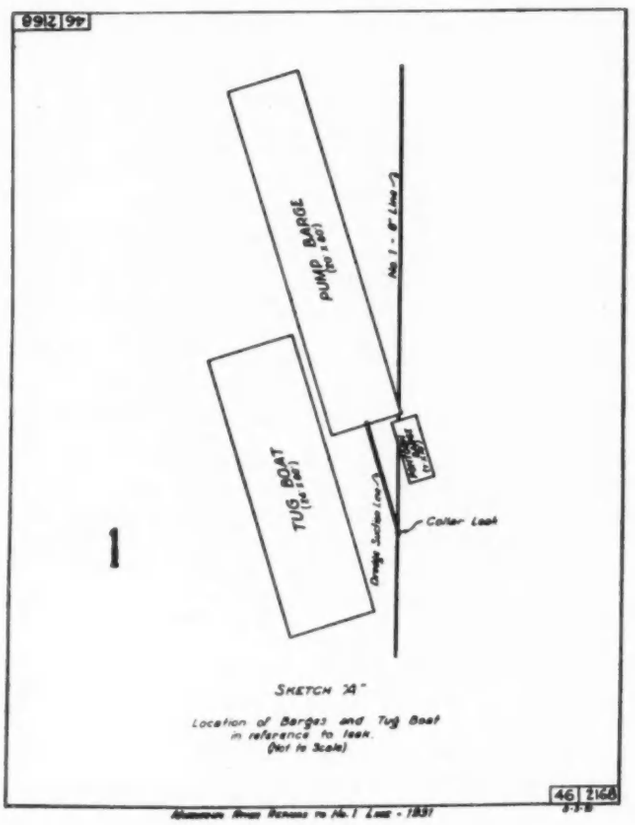
One small deck barge for working close to the water.

One rowboat with outboard motor for errands.

A diver with attendant and equipment was secured from Chicago.

A few days before this work was started the oil in the line had been displaced with air at 110-pounds pressure. This air pressure was maintained on the line during all the repair work and served the double purpose of facilitating the finding of the leak and showing at all times the amount of leakage.

The stuffing box used was one of the company's stand-



ard boxes except that steel packing glands were used instead of the customary cast iron glands. It was also decided to use graphite shredded lead packing instead of hemp or rubber.

After the fleet had been located and anchored as shown in Figures 1 and 2, the diver went down and found about one foot of fine silt over the line, making it difficult for him to exactly locate the leak. Figure 3 shows the diver ready to put on his helmet and submerge. The suction of the dredge was then lowered and the line cleared of silt for a distance of about 12 feet each side of the river clamp. The diver again went down and reported that the pipe was not pitted and that he could find no leak. It was known that the escaping air was being carried downstream by the current and it was decided to construct an inverted funnel which could be placed over the line and moved along the pipe until the bubbles were confined and brought vertically to a slot in the pipe just below the water level where they could be seen

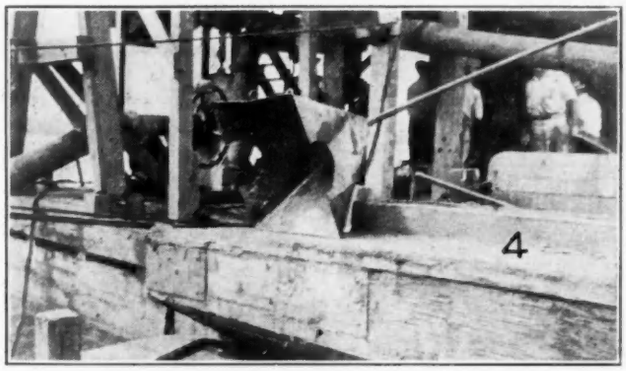
Leaks In Line On River Bottom

Stanolind Pipe Line Company

escaping. In Figure 4 this funnel can be seen lying on the sand barge. With the diver below guiding the funnel and the crew above supporting the weight and keeping the funnel vertical, the leak was found 20 feet further east than was expected. It was then necessary to dredge at this new location to clear this coupling. The clamp over this coupling was a heavy cast iron "river clamp" of the type used on most pipe lines in rivers and swamps to add weight to the line and strength to the joints. The diver next removed the clamp bolts and the clamp was brought up in halves as shown in Figures 5 and 6. He then cleaned the line thoroughly with wire brushes preparatory to putting on the stuffing box.

Figure 7 shows the stuffing box dismantled with seven rings of shredded lead packing in place in one end while Figures 8, 9, 10 and 11 show the manner in which the stuffing box was held open to fit over the line and how it was lowered into position. The packing was cut and carefully fitted into the box before lowering to the diver to facilitate his work in packing the box under water. Two bolts smaller than the bolt holes in the stuffing box held the halves together at the top while a one-inch by four-inch plank bored for the packing gland studs held the lower edges apart far enough to admit the line coupling. The machined edges of one of the halves of the stuffing box were fitted with an eight-inch sheet lead gasket and the gasket was firmly fixed to the edge by shellac and counter sunk screws. The box was lowered until it had started over the line and the boards were just clear of the pipe. The diver then removed the boards and, as the box was lowered, it slipped over the coupling and closed below the pipe. The correct bolts were then inserted and before tightening them the box was turned one-quarter turn on the pipe to bring it into a horizontal position with the two-inch tapped opening on top. Next the side bolts were tightened, the rings of packing placed and the gland fitted and tightened. After a two-inch plug had been tightened in the top of the box there were still some air bubbles appearing on the surface. To be sure that no other leak in the line was causing these bubbles, the two-inch plug was removed and a two-inch pipe screwed in to bring the air from the stuffing box to the surface. Since no air appeared except through this pipe, it was evident there was no other leak. As the packing gland did not fill the packing space by one-eighth of an inch, it was thought that more pressure could be put on the packing by inserting a solid lead ring between the gland and the shredded lead packing. This was done and all bolts again tightened. A hose from an oxygen tank was now lowered through the two-inch pipe into the stuffing box and the water in the pipe and box blown out. Figure 12 shows this operation. After the pipe and box were filled with cement grout of a fluid consistency using the funnel again (see Figure 13), the pipe was removed and the plug again screwed in and tightened. A very few small air bubbles were now appearing on the surface. The next day the diver was sent down again and after drawing all bolts a little tighter no air bubbles appeared on the surface. The oil was turned into the line and the repair was reported complete, as no oil appeared on the surface of the water.

The work consumed five days from the time the fleet was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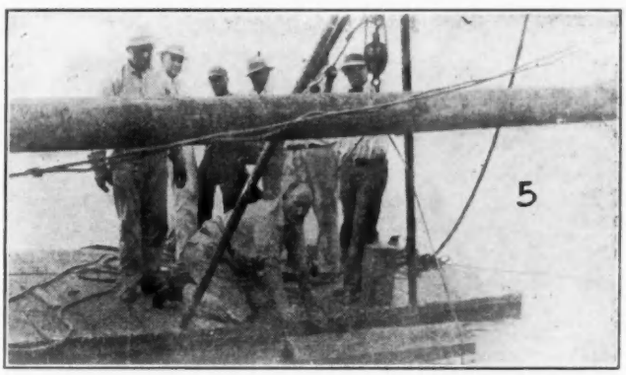
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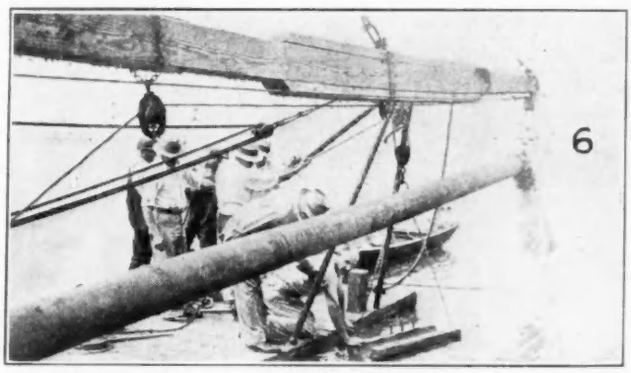
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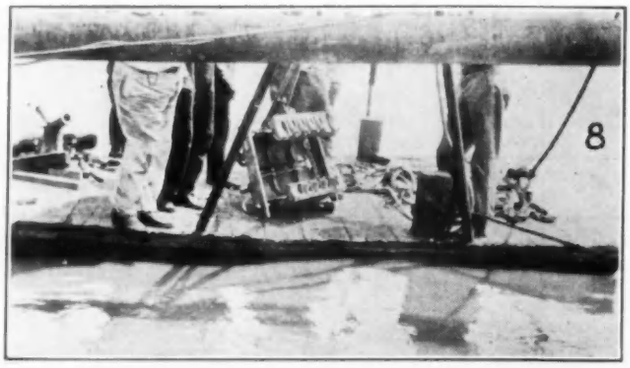

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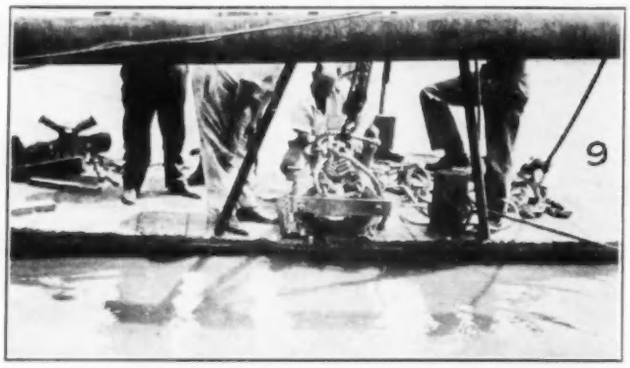

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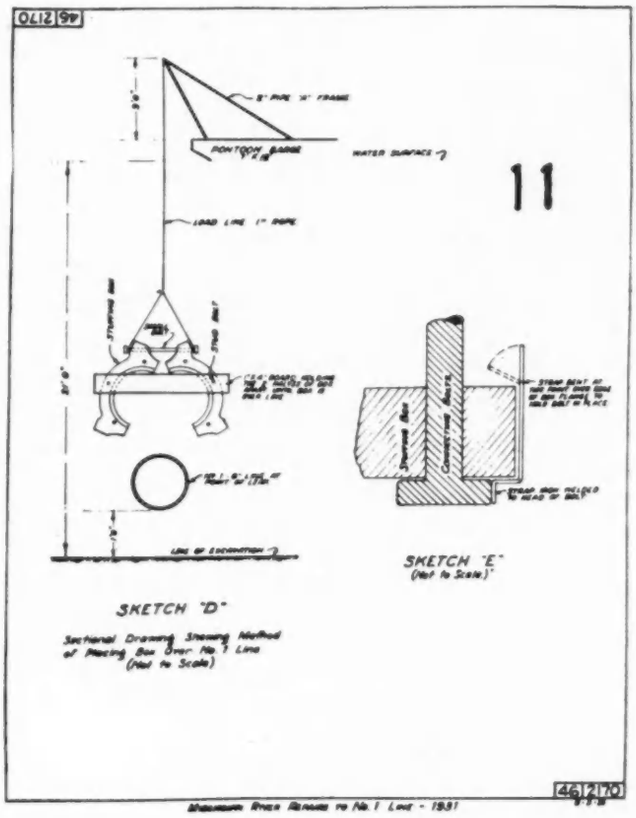
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SKETCH "D"
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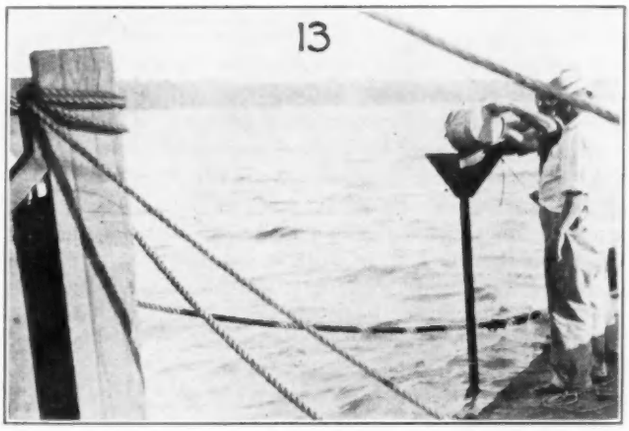

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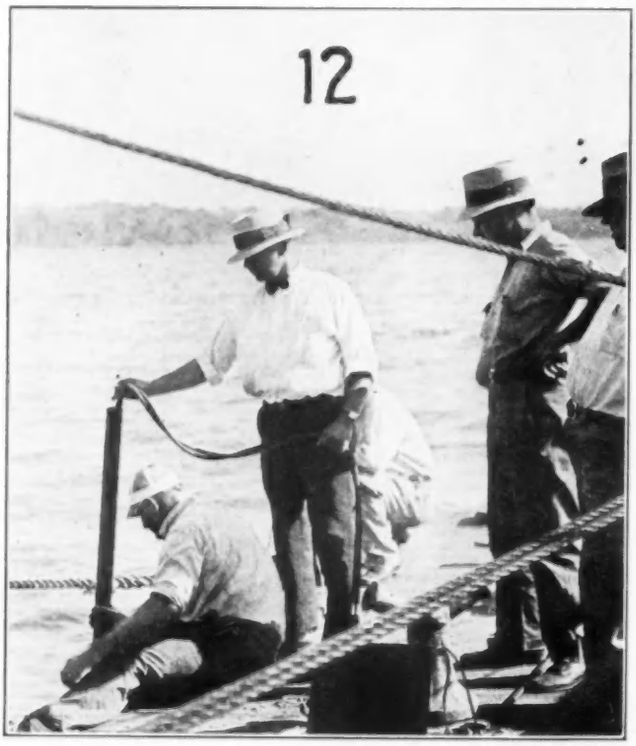

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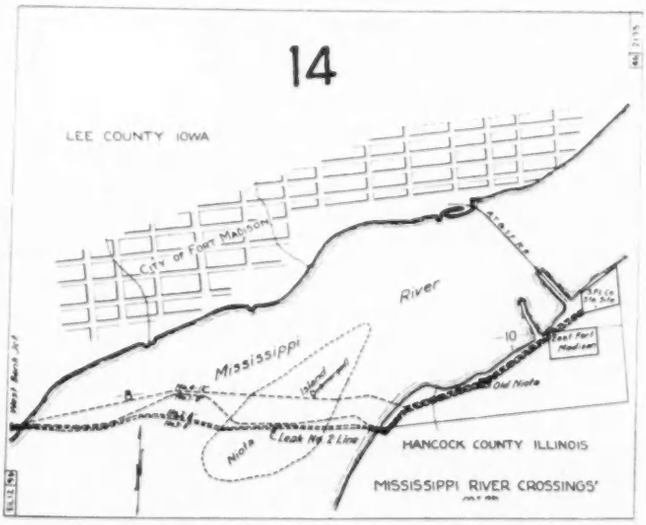
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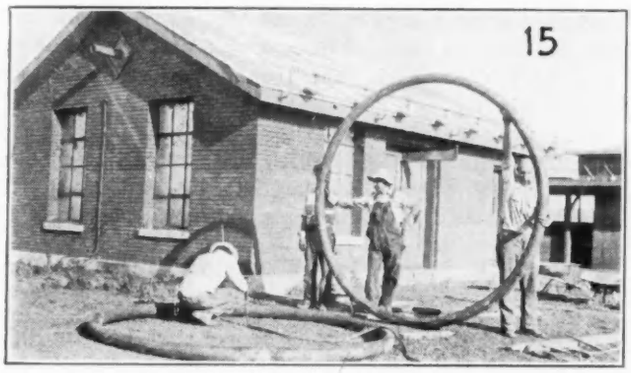
LEE COUNTY IOWA
CITY OF FORT MADISON
River
Mississippi
Old Niota
HANCOCK COUNTY ILLINOIS
MISSISSIPPI RIVER CROSSINGS



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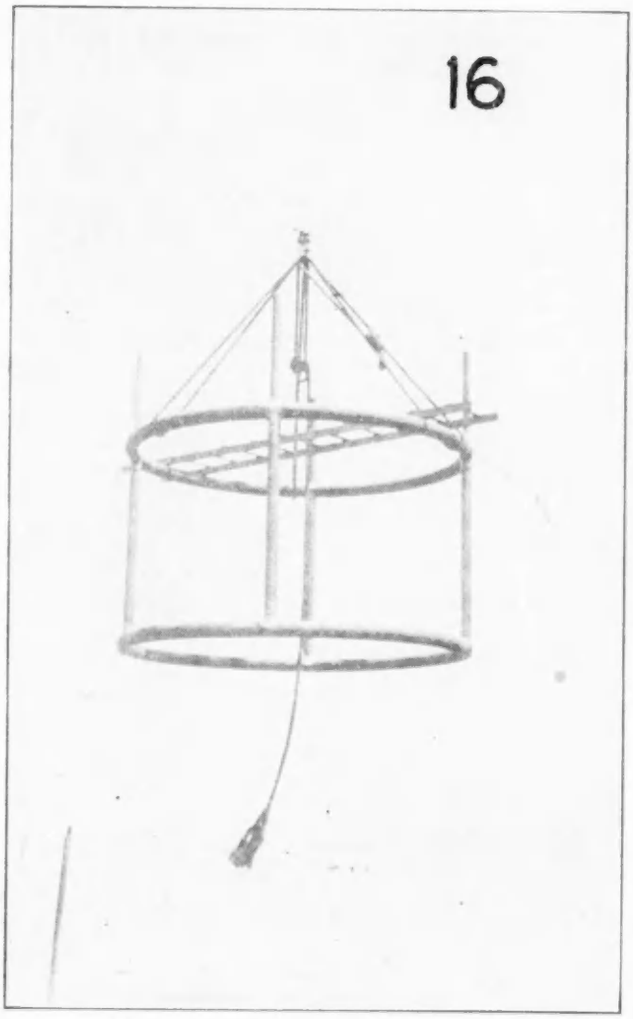

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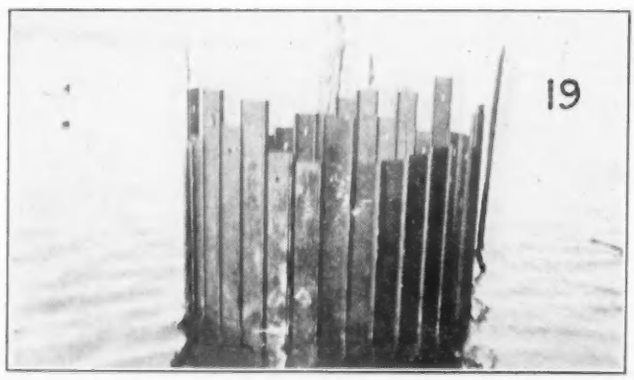

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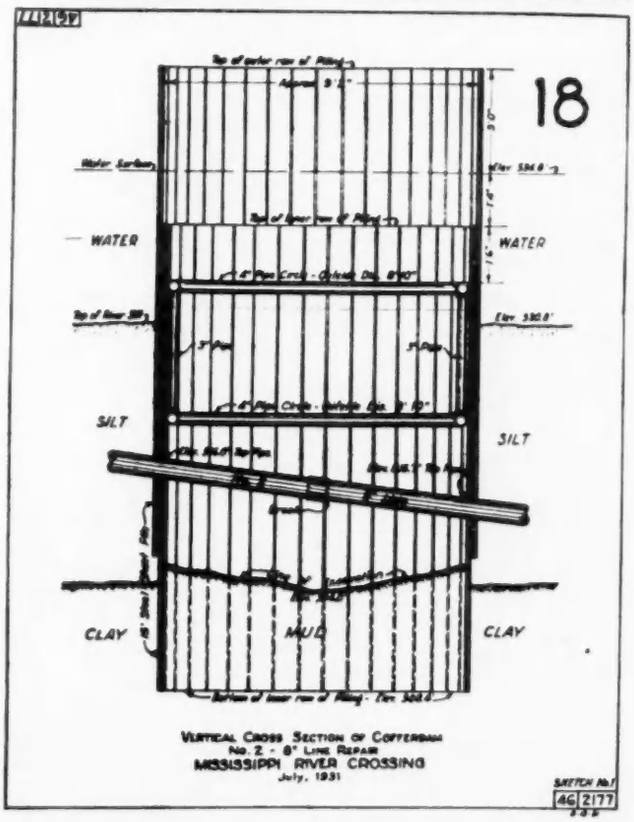
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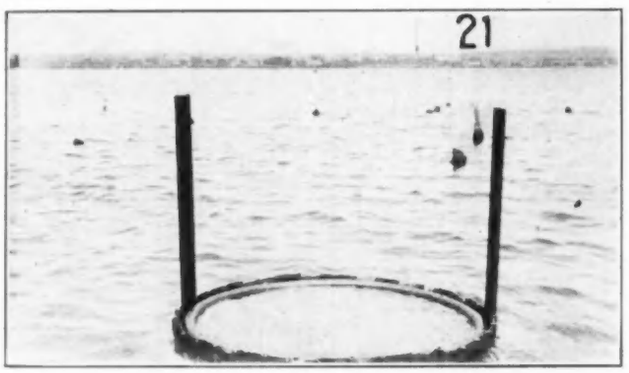
WATER
WATER
SILT
SILT
CLAY
MUD
CLAY
VERTICAL CROSS SECTION OF COFFERDAM
No. 2 - 8" LINE REPAIR
MISSISSIPPI RIVER CROSSING
July, 1931
46 2177



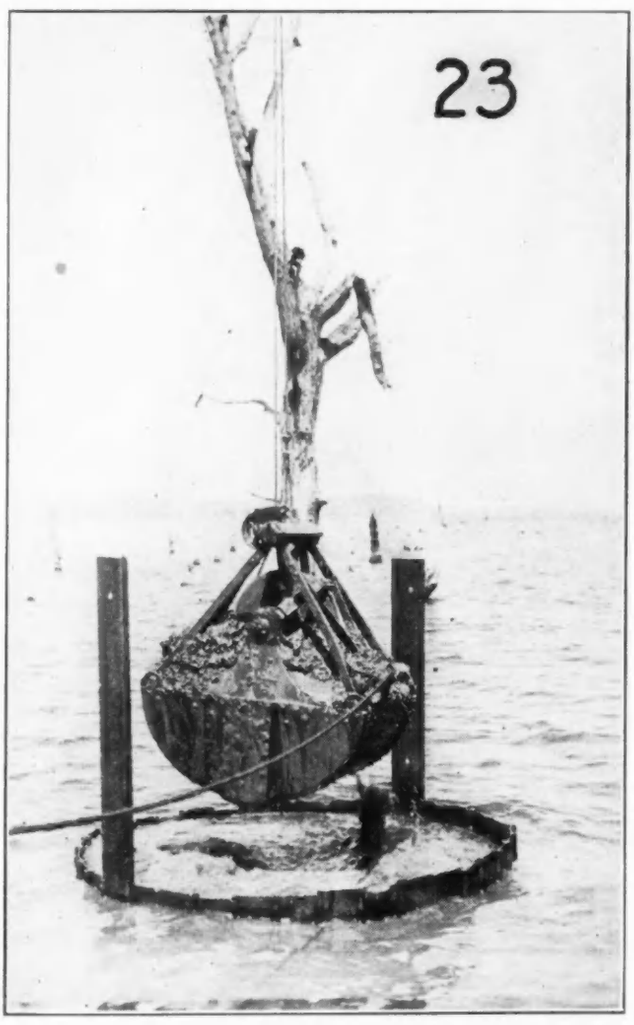
anchored at the leak until the line was put in service. The line has been in service without a leak since the repair was made early in July, 1931. The labor and equipment rental cost was $1,600.

This repair was made under the supervision of our general superintendent, Mr. W. G. Heltzel, assisted by Division Superintendent J. J. Cartmill, Welding Superintendent A. M. Hill, Division Engineer W. E. Brewer and the writer.

Repair of No. 2 Eight-Inch Line in the Mississippi River In July, 1931

This line had been cut out of service since February, 1929, when a leak had occurred which lost 3600 barrels of oil in three days. The leak was on an island about the center of the river as shown in Figure 14. When the Keokuk dam was completed in 1913 this island was covered with from four to 16 feet of water. The No. 2 line is a screw line laid in 1918 and since that time five to six feet of silt has been deposited over the pipe. When soundings were made at the leak in July, 1931, there was found to be five feet of silt and four feet of water above the top of the line. A stuffing box was put on the line after the first leak, but this job was not successful and, in June, 1931, two plans of repair were considered:

1. Dredge the line clear, raise it above the water and repair by welding. This plan was discarded because of the danger of springing collar leaks at other joints.
2. Sink an open sheet pile cofferdam and repair the line by welding. The latter plan was adopted and the equipment



used in the No. 1 line repair was secured in addition to the following:

One 10-ton floating derrick with 70-foot boom.
One ¾-yard clamshell dredge bucket.
One 700-pound drop hammer with swinging leads.
90 Lakawana steel sheet piles 9½-inch by 15-feet @ 15½ pounds per foot.

A loading dock near the job was rented for the duration of the work.

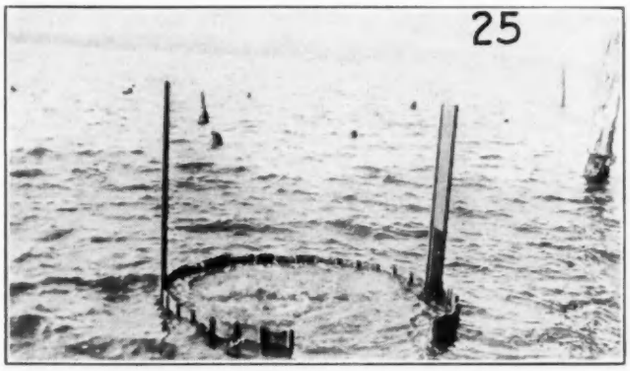
On the morning of July 21 the fleet was towed to the site and anchored, spotting the derrick in such a position as to conveniently dredge over the leak. The oil in the line had been displaced with air as in the No. 1 line. There was very little, if any, current at this place and the air was rising vertically from the leak.

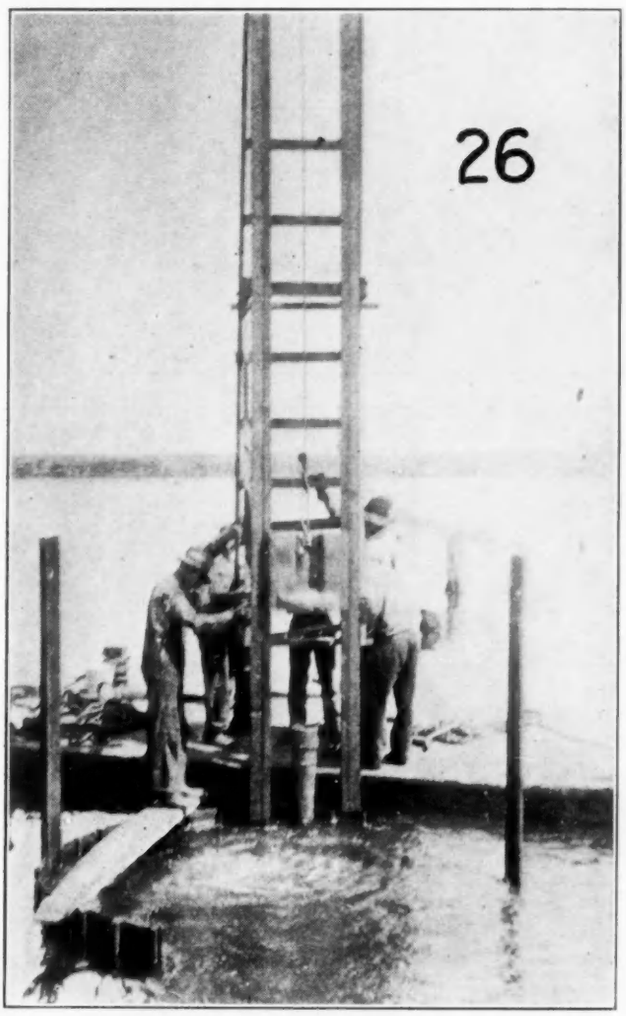
Pipe Bracing

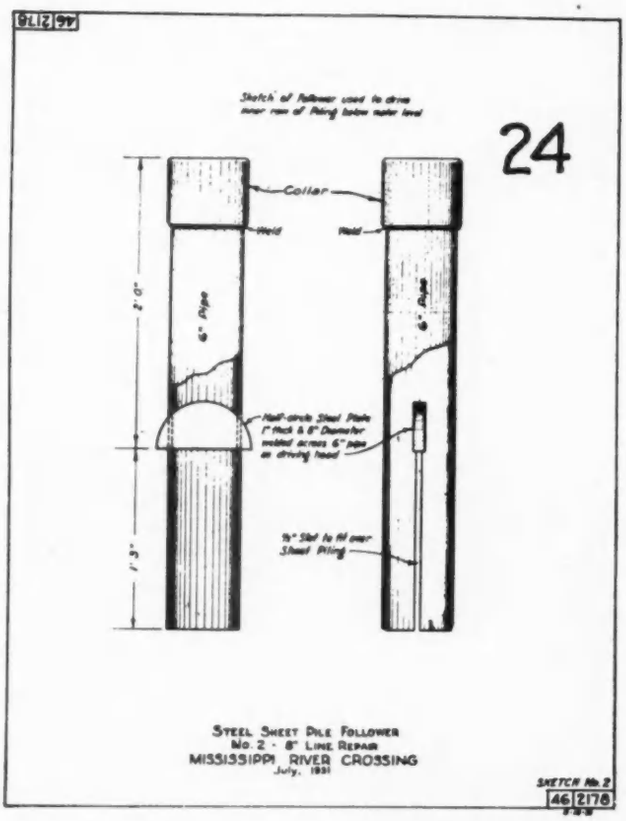
Preliminary to this work four lengths of four-inch pipe had been bent into half circles for cofferdam bracing. These half circles were welded into two whole circles of 8-feet-10-inches outside diameter, placed in parallel planes five feet apart and held thus by four posts of three-inch pipe welded in place. Figures 15 shows the circles and Figure 16 the completed bracing. The disturbance caused by the rising air bubbles shown in Figure 17 gives an idea of the size of the leak. This picture shows the bracing ready to set and Figure 18 shows it in its final position.

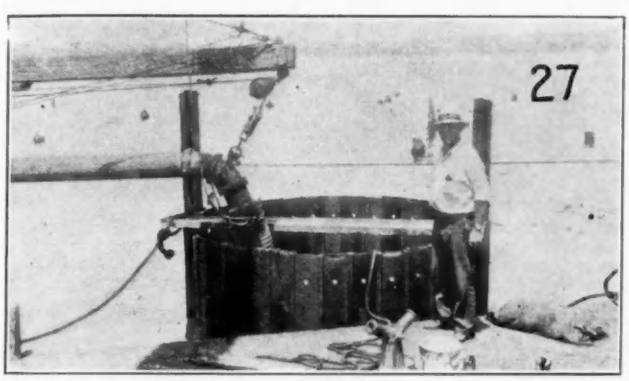
The first step was to set and level this bracing. It was set on the mud by means of a three-way sling and leveled by tapping lightly on the high points with the drop hammer.

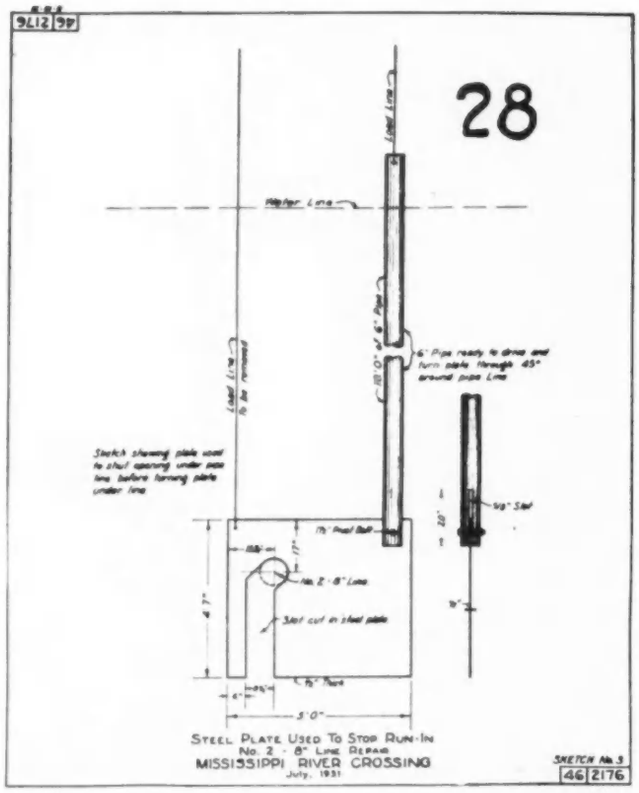
Three piles were then set over the pipe line on the west side of the cofferdam and likewise on the east. Of these three piles, the center one was located exactly over the line while the outside ones went on by and below the pipe line. This was done to be assured that there would be only one high pile on each side of the circle as it was thought that considerable trouble would be encountered







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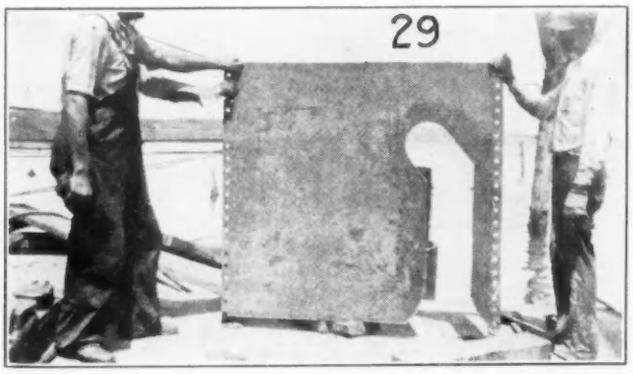
Sketch showing plate used to stop opening under pipe line before forming piles under line
No. 2 - 8" Line
Steel cut in steel plate
5'-0"
STEEL PLATE USED TO STOP RUN-IN
No. 2 - 8" LINE REPAIR
MISSISSIPPI RIVER CROSSING
July, 1931
SKETCH No. 3
46 2176

from mud running through this opening under the line. The balance of the piles were driven to a penetration of about eight feet below the pipe line. From these three piles, the other piles were set each way toward the opposite side making the key-in points on the north and south sides. Figures 19 shows the completed circle of piling ready to drive.

All piles, except the two resting on the line, were then driven to six-inches above the water, and enough silt was dredged from the inside of the cofferdam to allow the pipe bracing to drop about four feet. Figure 20 shows the driving crew at work and Figure 21 the piling driven to six-inches above water. Figure 22 shows the dredging with the top of the bracing still visible. In Figure 23 note that the bracing has dropped out of sight. As it was judged that a piling penetration of about eight feet below the line was advisable, it was necessary to drive the tops of the 15-foot piles two feet below water surface, and since a drop hammer was used for driving, a pile follower was required to drive the piles below water. The follower is shown in Figure 24. Figure 25 and 26 show part of the piles driven to grade and the follower in use.

Another circle of piling was set outside, but in close contact with this circle and driven to three feet above the water. While sheet piles 18 feet or longer would have made this cofferdam with only one circle of piles, it was considered cheaper to drive two circles of these light 15-foot piles which were near at hand than to ship in longer, heavier piles. The completed cofferdam is shown in Fifure 27. By means of the clamshell the silt was dredged down to the top of the pipe line and the cofferdam was ready to unwater. After two three-inch steam syphons were placed and started, horse manure thrown on the water around the cofferdam quickly stopped the leaks through the pipe interlocks and one syphon easily held the water down after the cofferdam was unwatered.

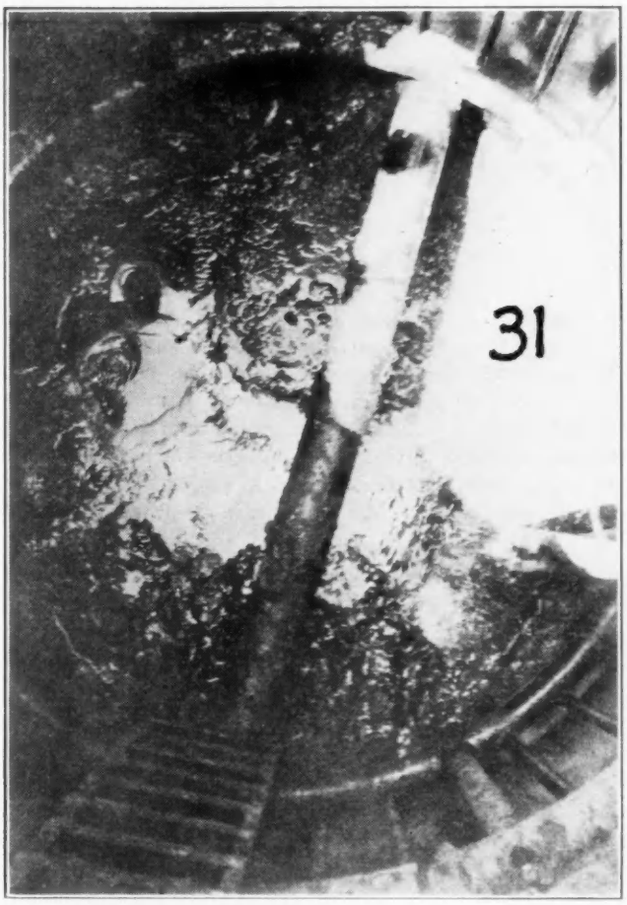
Upon starting further excavation to clear the line, silt began to ooze in under the line through the openings under the two high piles. After continuing this excavation for about four hours without any reduction in run-in, it was decided to close the opening below the line with steel plates. In this connection, it should be said that the idea of the steel plate was original with Mr. A. M. Hill and this method was chosen as likely to be the quickest and surest way of closing the opening. Figures 28, 29 and 30 show the plates before they were used. Preliminary to

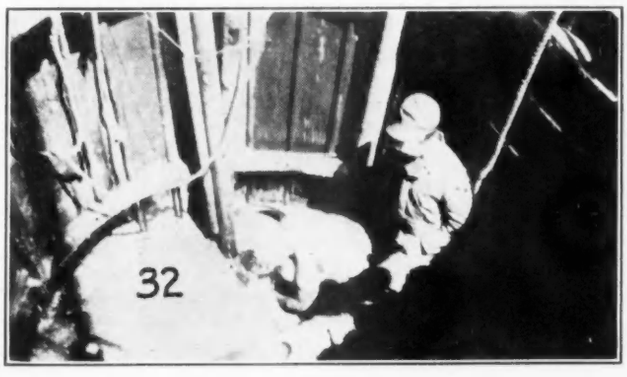


placing the plates in position the silt was dredged away from the pipe outside, and on each side of the cofferdam. The plates were lowered over the line with the slot vertical and the plates as near the sheet piles as possible. By means of a sheet pile guided by hand and hoisted by engine, the plates were tapped downward until the pipe line was in the very top of the slot. This was ascertained by measurement and by diving down and feeling the opening. Both plates were placed in this position first. Then using the leads and drop hammer the six-inch pipe, which was fastened to the plate as shown to take the blow of the hammer, was driven down until the plates was on a 45 degree angle, closing about four feet of the opening below the line. Two broken bales of hay were then floated over this point on each side and silt backfill was dropped on the hay. The hay was used to stop any small openings between the plates and the piles.

After unwatering again, excavation was begun and was continued without any run-in to 15 inches below the pipe line. The stuffing box which had been used unsuccessfully two years previously was removed and the pipe was found to be broken in the last thread on the bottom side about one-third around the circumference. Figure 31 shows the cofferdam ready for the welders. Note the two sand boils which raised the bottom four inches during the 3½ hours consumed in repairing the line. In Figure 32 can be seen the hole cut near the collar to allow the line to be "mudded up" and Figure 33 shows the welders starting to weld the coupling to the pipe.

The air pressure had been released from the line the previous day. When the hole was cut, three-quarters of an inch of oil was found in the line at this point and it was necessary to mud off the gas and oil each side of the collar. The line was welded to the collar completely around both sides and the hole was patched. A river clamp was put on over the joint, the cofferdam was flooded and oil was turned into the line for a test. When no signs of a leak were found the next morning, all piling and bracing were removed and the fleet was released. This repair job consumed eight days and cost $2,600. The work was supervised by the same force as No. 1 line repair with the exception of Mr. Heltzel, who was unable to be present until the last day. This line has been in service without a leak since last July.





Curves and Charts That Will Help

By STANLEY LEARNED
Engineer, Phillips Petroleum Company

IN the past two years, over 4000 miles of pipe lines, ranging in size from three-inch to eight-inch, have been constructed for the transportation of gasoline from refineries to the centers of population where large quantities of motor fuel are consumed. The economic conditions affecting the production, refining, and transportation of gasoline have led many, who are in close contact with costs, to predict the building of many more miles of gasoline pipe lines in the next few years.

Particularly by those companies who have constructed gasoline pipe lines, there has been much thought and study with reference to the friction of gasoline flow—but very little has been published on this very important phase of pipe line design. It is the purpose of this paper to present some ideas and suggestions and to develop some curves and charts which will be of help in the designing of gasoline pipe lines.

Importance of Correct Hydraulic Design

Inasmuch as:

1. Selection of operating pressures, pipe sizes and thicknesses.
2. Location and spacing of stations.
3. Selection of pumping equipment.
4. Selection of motive power in type and size

are all dependent on knowledge of line friction, one can immediately see the necessity for reasonably accurate knowledge of fluid flow characteristics. Before proceeding to the short cuts of solution, let us trace a little of the history of our knowledge of pipe line friction in general and then more particularly of the pipe line flow of petroleum products.

Hydraulics of Fluid Flow in Pipes

Hydraulics is not an exact science, but is essentially an engineering science. Hydraulics may well be considered as a science with a theoretical background and an experimental superstructure. Our present knowledge of fluid friction has been derived entirely through experimental investigation. The application of hydraulics to any problem involves the use of judgment and experience, as well as mathematics and mechanics.

Regardless of the formulas selected, the accuracy of the final result depends entirely upon the selection of the correct friction factors for the formula used. Before selecting a formula for gasoline flow problems, let us review the development of the fundamental pipe line equation.

We have found that there are certain general laws which appear to govern fluid flow in pipes. These conclusions are as follows:

1. Frictional resistance is independent of the pressure within the pipe, other things being equal.
2. Frictional resistance increases with the roughness of the pipe or conduit.
3. Frictional resistance is directly proportional to the wetted area, or for pipes the length.
4. The retarding influence of viscosity becomes less as the pipe becomes larger.
5. Frictional resistance varies directly as some power of the velocity.
6. Frictional resistance increases with viscosity.

These laws or conclusions may be represented as a formula, as follows:

Let us represent

(1) Frictional resistance by h_f
(2) The effect of roughness and of viscosity by f
(3) The length by l
(4) The effect of the pipe size by d^m
(5) The effect of velocity by v^n

We may then write the general formula for the flow of liquids in pipes,

$$h_f = \frac{f\,l\,v^n}{d^m}$$

It is from this generalization that all specific formulas for the calculation of friction in pipe lines have been developed. Regardless of the formula selected, the accuracy of the results depends entirely upon the selection of the proper friction factors (f) for the formula used.

Solution of Oil Pipe Line Friction Problems

Inasmuch as the gasoline lines were built by oil companies whose engineers had been designing oil lines, the natural tendency was to adapt the oil design formulas to design the gasoline lines. Inasmuch as this paper is recommending a method of design for gasoline lines radically different than that used for crude design, let us consider first, the necessity for the crude line friction method, and second, the differences between oil and gasoline that make other methods desirable for gasoline.

As early as 1883, Professor Osborne Reynolds determined that there were two types of flow; i.e., streamline and turbulent. He further determined that there was a range in which nothing but streamline flow could exist and that there was another range in which nothing but turbulent flow could exist.

He proved that the type of flow to exist depended upon a ratio of $\frac{Dvs}{u}$ where

D = diameter of pipe in feet
v = velocity of fluid in feet per second
s = density of fluid in lbs. per cu. ft.
u = absolute viscosity in foot-poundal-second sys.

At small values of $\frac{Dvs}{u}$ the flow was streamline. At values of from 2000 to 2500, the flow changed to turbulent. Later,

in Designing Gasoline Pipe Lines

ALIGNMENT CHART FOR SOLUTION OF HAZEN AND WILLIAMS FORMULA

FORMULA:-

$$p^{1.85} = \frac{152.04\, Q\, g^{0.56}}{cd^{4.85}}$$

WHERE
p = POUNDS PER SQUARE INCH FRICTION LOSS PER MILE
Q = DISCHARGE IN BARRELS PER HOUR
g = SPECIFIC GRAVITY
d = INSIDE DIAMETER OF PIPE IN INCHES

Examples:
(1) Given: To transport 20,000 Bbl. of 60° Be' gravity gasoline thru 8" line pipe having a roughness Coefficeint C = 145
To find:- P (pressure loss)
Solution:-
(a) Draw Straight line from 20,000 Bbl. per day on axis II and 60° Be' scale On axis I, locating point (a) on axis III
(b) Draw straight line from point (a) on axis III thru C = 145 on axis IV, locating point (b) on axis V
(c) Draw straight line from point (b) on axis V to 8" std. pipe size on axis VII locating answer of 9"/□" per mile on axis VI.

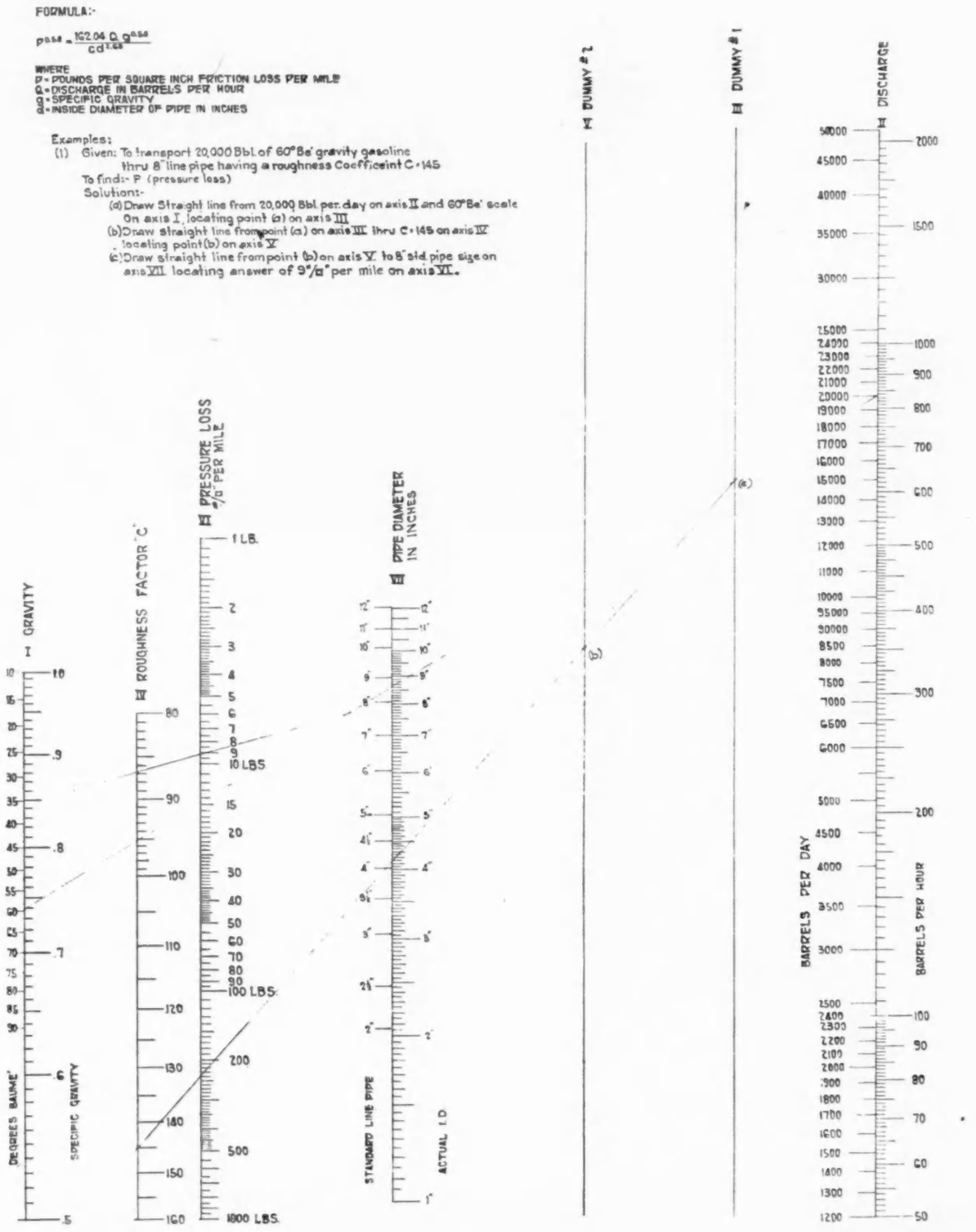


FIGURE 1

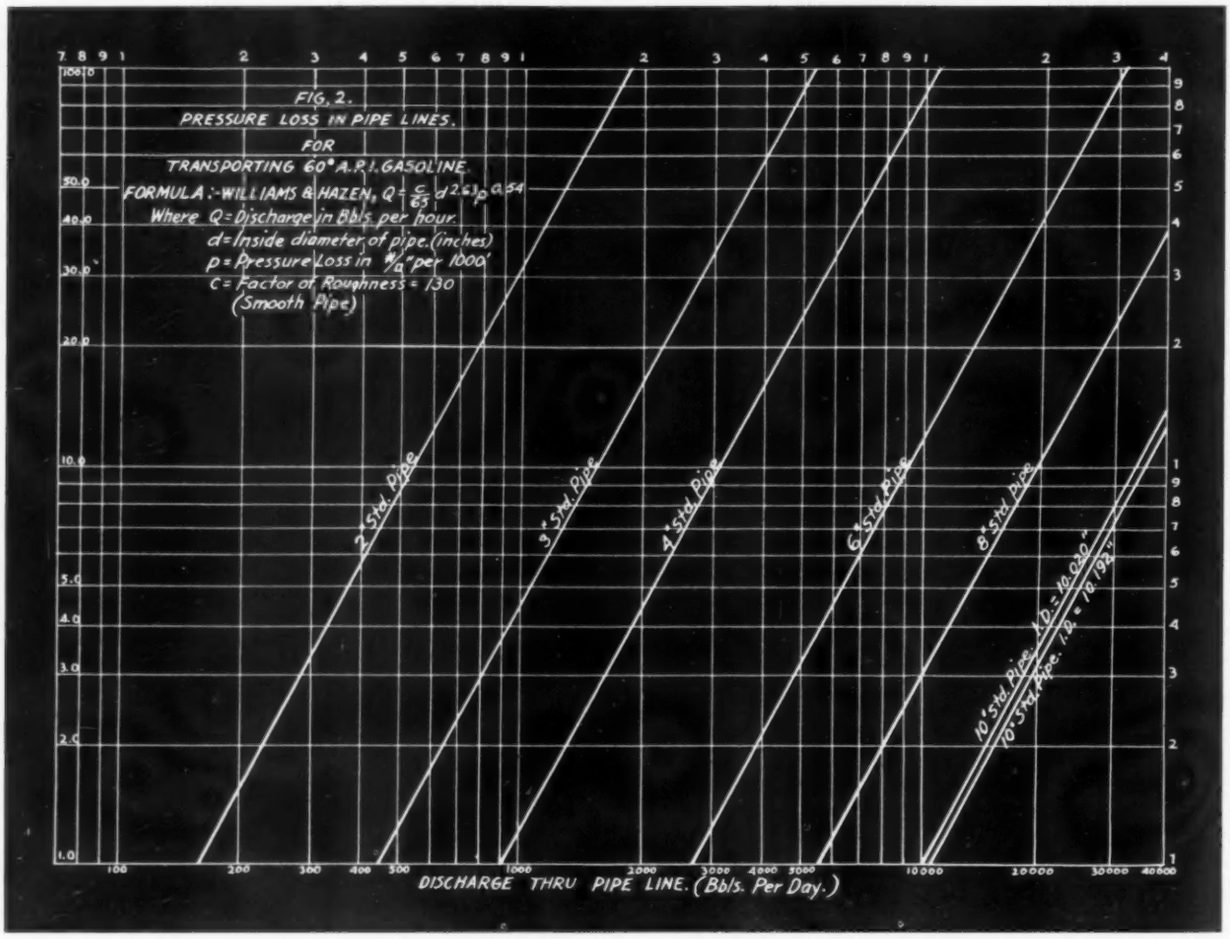


FIG. 2.
PRESSURE LOSS IN PIPE LINES.
FOR
TRANSPORTING 60° A.P.I. GASOLINE.
FORMULA:- WILLIAMS & HAZEN, $Q = \frac{c}{65} d^{2.63} p^{0.54}$
Where Q = Discharge in Bbls. per hour.
d = Inside diameter of pipe. (inches)
p = Pressure Loss in #/□" per 1000'
C = Factor of Roughness = 130
(Smooth Pipe)
2" Std. Pipe
3" Std. Pipe
4" Std. Pipe
6" Std. Pipe
8" Std. Pipe
10" Std. Pipe. I.D. = 10.020"
10" Std. Pipe. I.D. = 10.192"
DISCHARGE THRU PIPE LINE. (Bbls. Per Day.)

experimenters found a further use for this Reynolds number. They found that there was a distinct relation between the Reynolds number and the factor "f" in the modified Darcy formulas. After numerous experiments, curves have been prepared, showing the relationship between the friction factor and the Reynolds numbers. In general, all crude line problems are solved from the Darcy formula ($h_f = \frac{flv^2}{2gd}$), determining the friction factor f after the calculation of the Reynolds number. This method has been extremely well-adapted for calculating friction losses in oil pipe lines.

Many people have the erroneous idea that friction losses calculated by the above mentioned methods give exact results, when, in reality, they are only as correct as the curve for f. This has gone so far that one writer in the trade journals in discussing gasoline pipe line friction in which the oil line method was recommended, says, "After the ratio of $\frac{Dvs}{u}$ is calculated, the value is taken to the curve and the coefficient of friction for the given condition is found. *Thus, there is no assumption made for determining the coefficient of friction.*"

The above statement is, no doubt, true as far as the writer of the paper was concerned, for someone else had done his assuming in preparing a recommended curve for f at different values of the Reynolds number.

To further remove this idea that results calculated from f determined by the Reynolds number will be exact, let us consider the effect of variation in accuracy of the determination of f. f is normally in a range of values between .020 and .040. Please note that an error in selection, of only .002, will mean an error in the final result of from five to 10 per cent, depending on the value of f. This mention of the possible inaccuracies of the crude oil method is not made to be derogatory of that method, but is made to clear the way for a recommendation for gasoline lines of another method, which, to the writer, is simpler to use and is at least as accurate as the methods used for crude oil pipe line design.

Selection of Formula for Gasoline Line

It would appear that the selection of a formula would be governed by:

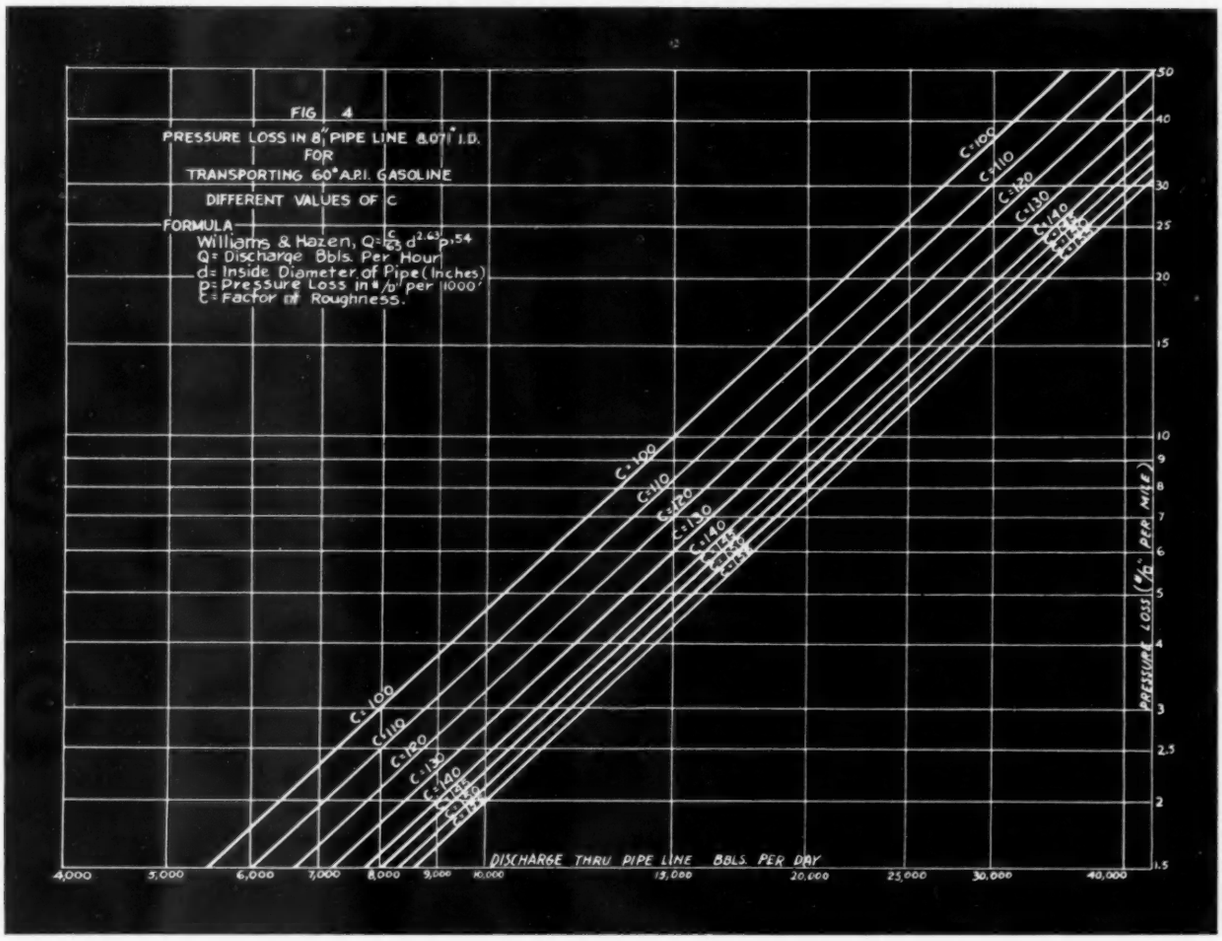
(1) A formula whose exponents are such that one series of friction factors will meet all conditions.

(2) A formula which is in a form for easy solution.

(3) A formula which involves knowledge of the product which is being pumped which is easily obtainable.

The crude line method was not particularly interesting because it required the knowledge of gasoline viscosity. Methods for the determination of gasoline viscosity are not readily obtainable. Consequently, we were led away *From the Formulas* which referred to viscosity. Although there is not a great deal published about the viscosity of gasoline, such information as is available shows the values low and close to the values of water, so we were led to consider the formulas for flow of water in pipes.

The solution of water friction problems is generally made with the Chezy formula. This formula is hard to use because its friction factor depends upon the roughness of the pipe and also upon the hydraulic radius and the slope. About 1902, Hazen and Williams developed their formula, using exponents for the hydraulic radius and the hydraulic slope, which repre-



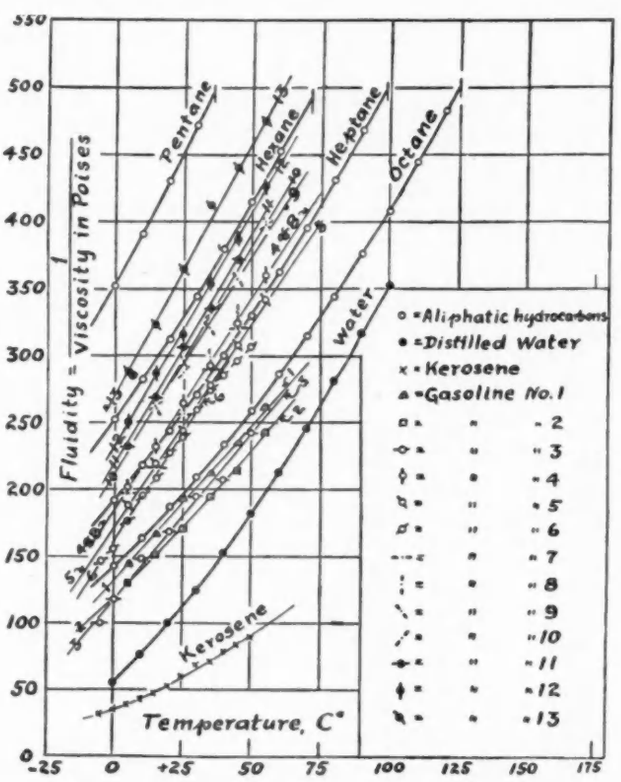


FIG. 3 —*Temperature-fluidity curves of gasolines and other liquids*

sented, "as nearly as possible the average conditions, as deduced from the best available records of experiments upon the flow of water." In this way, "the value of c for a given condition of surface will vary so little as to be practically constant." Naturally, this formula will not give exact results, but inasmuch as the Shell Oil Company of California had used this method in the design of their 100-mile line, we were led to consider it quite seriously. A comparison of friction losses on numerous lines of our own and of lines on the Pacific Coast further verified the use of this formula.

The Hazen and Williams formula, as originally recommended, is:

$$v = c\, r^{0.63}\, s^{0.054}\, .001^{-0.40}$$

Where v = velocity in feet per second
s = slope
r = hydraulic radius in feet
and c = constant

By introducing the specific gravity of the liquid and converting the values, we arrive at an equation:

$$Q = \frac{c\, d^{2.63}\, P^{0.54}}{6.75\, g^{0.54}}$$

Where Q = capacity barrels per day
d = I. D. in inches
P = pressure loss in lbs./sq. in. per mile
g = specific gravity of gasoline

This formula has fulfilled the three requirements given above, except that it is not in a form for easy solution because of the exponents used. This objection was eliminated by the prepara-

Conventional barge method for laying river lines. In this instance barge was ready to be moved ahead for tong gang to screw on another joint of pipe.

tion of an alignment chart for its solution, which is shown in Figure 1.

Easy Solution of Gasoline Pipe Line Formula

There are several advantages to alignment chart solutions, which are particularly worthwhile in this application:

1. Scales, once placed and properly located, may be made to read in as many different ways as desired, such as:
   (a) Discharge scale in barrels per day, barrels per hour or gallons per minute
   (b) Gravity scale in specific gravity and baume scale
   (c) Pipe diameter in actual I. D. and nominal pipe size.
2. Chart covering large range conditions is placed on one sheet.
3. Solved by drawing straight lines.
4. Solution for any unknown is easy.

The selection of the value of c to be used for this formula is the next question. Our original ideas, based on results of short lines of new pipes, led to the use of a value of $c = 130$. Later, tests on longer lines, conducted at warm temperatures, led us to a higher value of c up to $c = 140$. Suggested values of c and the factors affecting c will be mentioned more completely later.

Numerous problems arise wherein solution by use of the alignment chart becomes bunglesome, such as the condition when one is to pump gasoline of a definite specific gravity (.75) and with pipe whose friction coefficient is known, say $c = 130$. Such a condition can better be handled by a plotting on double logarithmic paper so that the friction loss for any size pipe may be expressed as a straight line, when the abscissas represent barrels per day and the ordinates represent loss in lbs./sq. in. per mile (See Figure 2).

Inasmuch as there was little published on the viscosity of gasoline and of its variation with temperature, we, in our early investigations, did not attempt to chart the flow conditions for winter and summer, but only for the year's average. It so happens that the peak demand for gasoline is in the summer months, when the line has its greatest capacity so it was of no particular consideration.

However, it is necessary to know the line capacity for each month in order to estimate shipments, earnings, etc. This involved a study into the effect of temperature upon friction. Figure 3 is a chart showing the variation of the fluidity (the reciprocal of the absolute viscosity in poises) of certain gasolines and pure hydrocarbons at different temperatures (from Bureau of Standards, Technological Paper No. 125). You will note that there is a large variation of viscosity within the range of temperature rom 30°F. to 80°F., which is the approximate range of pipe line flow temperatures.

Suggested values of c for different temperatures will be given later, but for easy calculation of specific problems, we submit Figure 4, which shows variation of capacity of an eight-inch pipe line, handling .75 specific gravity gasoline at different pressures with varying values for c.

Study of the Values for c in Hazen and Williams Formula

In order that we might have better information on friction of gasoline, we have kept a daily record of the operations of

TABLE I

STUDY OF VALUES OF CONSTANT "C" IN HAZEN-WILLIAMS FORMULA FOR FLOW OF FLUIDS, WHICH ARE OBTAINED FROM ACTUAL OPERATING DATA OF AN 8″ WELDED STEEL LINE CARRYING GASOLINE

Section of Line—Laverne to Attica

Length of Section—103.9 Miles—Static Drop, 531 Feet.

1	2	3	4	5	6	7	8	9	10	11	12
Month	Day	Laverne Discharge Pressure Lbs./Sq. In.	Sp. Gravity of Product at Laverne	Head at Laverne in Feet	Attica Intake Pressure Lbs./Sq. In.	Sp. Gravity of Product at Attica	Head at Attica Suction in Feet	Total Friction Loss in Ft. (5)—(8) +531′	Friction Loss in Ft./Mile (9)÷103.9	Quantity Pumped Corrected to 60°F. Bbls.	C in H & W Formula
September	1	840	.745	2605	55	.745	171	2965	28.5	18,762	134
	2	825	.675	2820	65	.745	202	3149	30.3	18,494	129
	3	789	.675	2700	50	.745	155	3076	29.6	18,673	131
	4	750	.745	2320	40	.675	137	2714	26.1	18,002	135
	5	830	.745	2570	50	.675	171	2930	28.2	19,015	138
	6	830	.745	2570	125	.745	390	2711	26.1	18,344	137
	7	830	.675	2905	35	.745	109	3327	32.0	18,894	127
	8	825	.675	2820	45	.745	140	3211	30.9	18,804	130
	9	840	.675	2870	45	.675	154	3247	31.3	18,743	127
	10	825	.745	2560	35	.675	120	2149	20.7	18,517	159
	11	840	.745	2605	50	.675	171	2965	28.5	18,480	133
	12	844	.745	2610	35	.745	109	3032	29.2	18,410	131
	13	840	.745	2605	30	.745	93	3043	29.5	18,963	134
	14	835	.675	2860	30	.745	93	3298	31.7	19,002	139
	15	830	.675	2840	35	.745	109	3262	31.4	18,738	127
	16	835	.675	2850	45	.675	154	3227	31.5	18,822	128
	17	855	.675	2920	30	.675	162	3349	32.2	19,127	128
	18	880	.675	3010	35	.675	120	3421	33.0	18,767	124
	19	885	.675	3020	30	.675	103	3448	33.2	18,902	124
	20	880	.745	2720	60	.675	205	3046	29.3	18,145	129
	21	895	.745	2780	55	.675	187	3124	30.1	17,718	123
	25	895	.65	3180	80	.745	248	3463	33.3	18,140	120
	30	540	.745	1670	140	.65	498	1703	16.4	14,442	138

Phillips Pipe Line Company; and, recently, another pipe line company gave us access to its records for checking. From this data, we have been able to reach some fairly accurate and positive results. As further data from other operators of gasoline lines is made available, further conclusions can be reached.

From actual daily pumpings, we get more nearly the results to be expected in actual operation than can possibly be obtained by any special tests which are made under ideal conditions after careful preparation. In other words, it would seem that the friction factor we desire is one which we will get in every day operation and not one obtained by very carefully prepared and conducted tests.

Tables 1 and 2 show typical operating data and calculations. Data similar to that shown in these tables has been kept and calculated since the start of operations of Phillips Pipe Line Company. After almost a year of operation, we have found, for our main system of eight-inch electric weld pipe, a value of c for average of 130. A check of the operations of another large gasoline pipe line with seamless pipe has shown average value of c slightly less than 130. The data is not complete enough to make any recommendations at this time for differing values c for different pipes.

It appears also that the values for c for smaller size pipes than eight-inch are slightly higher than those for eight-inch pipe. If sufficient information can be obtained, we believe that we can arrive at a small change in the exponents in the Hazen and Williams Formula, so that values of c will be constant for varying sizes of pipe.

We gave no particular thought to the variation of line capacity with temperature until this winter, when we found a considerably smaller line capacity than we had had in summer months. Inasmuch as we had not expected quite as large a seasonal variation, we investigated more carefully the results we were obtaining and compared these with viscosity curves. We found that our variation in capacity followed a straight line curve similar to the curves shown in Figure 3 for gasoline fluidity. Further comparison of results has led us to the conclusions reported herein.

Ramp barge crossing Mississippi River near Fort Madison, Iowa, August 1931.

Conclusions and Recomendations

1. The Hazen and Williams Formula, as revised, presents an easily solvable formula, which will give accurate results for gasoline friction flow.
2. Based on present information, the value of c, for new pipe, is approximately 130 for average year around conditions of Northern Texas, Oklahoma, Kansas, Missouri, and Illinois (Temperature average of 50°).
3. Although more complete knowledge of the variation of gasoline viscosity with temperature and the corresponding variation of c is needed, it would appear that for

TABLE II

STUDY OF VALUES OF CONSTANT "C" IN HAZEN-WILLIAMS FORMULA FOR FLOW OF LIQUIDS, WHICH ARE OBTAINED FROM ACTUAL OPERATING DATA ON AN 8" WELDED STEEL LINE CARRYING GASOLINE

SECTION OF LINE—BORGER TO LAVERNE

Length of Section—109.9 Miles, Static Drop in Feet, 717 Feet

1	2	3	4	5	6	7	8	9	10	11	12
Month	Day	Borger Discharge Pressure Lbs./Sq. In.	Sp. Gravity of Product at Borger	Head at Borger in Ft.	Laverne Intake Pressure Lbs./Sq. In.	Sp. Gravity of Product at Laverne	Head at Laverne Suction in Feet	Total Friction Loss in Ft. (5)—(8) +717′	Friction Loss in Ft./Mile (9)÷109.9	Quantity Pumped Corrected to 60°F. Bbls.	C in H & W Formula
September	1	840	.675	2870	88	.745	273	3314	30.2	18,762	130
	4	850	.745	2640	60	.745	186	3171	28.8	18,001	129
	5	872	.745	2700	50	.745	155	3262	29.7	19,014	134
	6	850	.675	2903	95	.745	295	3327	30.3	18,344	128
	7	845	.675	2890	48	.675	164	3443	31.4	18,893	128.5
	8	850	.675	2905	59	.675	202	3420	31.1	18,804	128.5
	9	855	.745	2650	33	.675	113	3254	29.6	18,743	132
	10	850	.745	2640	94	.745	292	3065	27.9	18,517	135
	11	850	.745	2640	25	.745	77	3280	29.8	18,480	130
	12	850	.745	2640	20	.745	62	3295	30.0	18,410	129
	13	850	.675	2903	33	.745	108	3514	32.0	18,963	128
	14	850	.675	2905	30	.675	102	3520	32.0	19,002	129
	15	850	.675	2905	35	.675	120	3502	31.9	18,738	127
	16	850	.675	2905	35	.675	120	3502	31.9	18,821	128
	17	850	.675	2905	50	.675	171	3451	31.4	19,127	130
	18	850	.675	2905	75	.675	256	3366	30.6	18,767	130
	19	850	.745	2640	85	.675	291	3066	27.9	18,903	137
	20	800	.745	2480	75	.745	233	2964	27.0	18,146	135
	21	846	.745	2625	179	.745	555	2787	25.4	17,718	135
	22	620	.65	2200	213	.745	660	2257	20.5	16,368	139
	23	500	.65	1775	80	.745	248	2244	20.4	16,189	138
	25	675	.745	2090	40	.65	142	2665	24.2	18,140	143
	30	450	.745	1395	100	.745	310	1802	16.4	14,412	138

smooth pipe c increases or decreases about three-quarters for every degree Fahrenheit rise or fall in temperature from 50°. In other words, at 70° flowing temperature, $c = 145$, and at 30° flowing temperature $c = 115$.

4. There appears to be a slight variation in values of c for different size pipes—i.e., values of c for smaller pipes are slightly greater than those recommended herein. The writer believes that it is quite possible that a small change in the exponents of the hydraulic slope and the diameter will correct this apparent defect in the formula. As more actual operating data becomes available, this will be carefully checked.

5. Further and more complete information on this subject can be obtained if such data as shown in Tables 1 and 2, Columns 1 to 7, inclusive, and, in addition, a column for flowing temperature, can be obtained from other companies operating gasoline lines. The writer will welcome the receipt of such information in order that more complete data on this subject may be presented at a later date.

6. The values of c for (1) Varying temperatures or viscosities, (2) Varying types of pipes, can be checked with the information obtainable from the companies operating gasoline pipe lines.

Acknowledgements

The writer wishes to acknowledge the suggestions and assistance of Mr. A. H. Riney, chief engineer of Phillips Pipe Line Company; Mr. A. W. Hubbell, superintendent of Phillips Pipe Line Company; and Messrs. L. T. Gibbs and M. O. Johnson, of the engineering department of Phillips Petroleum Company.

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Welder at work under shelter with ice flooring, Fort Madison, Iowa, January, 1930.

Operation Costs of Diesel Driven Centrifugal Units

By J. B. HARSHMAN
Stanolind Pipe Line Company

DURING the early years of the oil industry, pipe lines were dependent almost entirely upon the steam driven pumping unit, which, owing to its low thermal efficiency, was rendered more or less obsolete by the development of the Diesel engine.

Most Diesel driven pumping units, until recently, have consisted of an engine direct connected through a flexible coupling to a reciprocating pump. Such units, having a mechanical efficiency of around 80 per cent for the engine and a mechanical efficiency of from 85 to 90 per cent for the pump, have been considered about the best type of equipment for pipe line work. However, such units require a large investment in foundations, buildings, cooling systems, auxiliary installations, etc.

With the development of the higher speed Diesel engine the Diesel centrifugal unit, with a gear increaser, has come into service.

Until recently the centrifugal pump has been driven almost exclusively by the electric motor. Such units have the advantage of low installation costs and low annual fixed charges, but these savings are offset in most cases by high electric power rates.

With the Diesel driven centrifugal unit it is possible to reduce the investment and installation cost, which combined with low operation costs gives it a competitive advantage over other types of pumping units which have been in general use.

Such a Diesel driven centrifugal unit has been installed by one of the principal oil pipe line companies. The engine is a 300 horsepower vertical, six-cylinder, four cycle, solid injection type, 750 r.p.m., which is direct connected through a flexible coupling to a single pinion gear increaser of 4.73 to 1 ratio. The high speed shaft of the gear increaser is direct connected through a second flexible coupling to a six-inch four-stage centrifugal pump, operating at 3550 r.p.m. The capacity of the pump is 25,000 barrels per day at 450 pounds per square inch line pressure.

The pump and gear increaser are mounted together on a cast iron base plate and grouted in integral with engine foundation. The whole foundation, when resting on firm soil, requires only 30 yards of concrete.

Installations of this type can also be assembled on "I" Beams and operated with no foundation. This method is particularly desirable for rush installations in flush fields.

An all steel building 20 feet wide by 34 four feet long houses the unit with ample room on all sides. The total length of the unit being approximately 22 feet. The unit weighs 22,000 pounds, of which the engine weighs about half. Thus, one can see the advantage of portability when used for temporary installations or in remote places, which can be made in four to six days. The manufacturers point out that with the use of "I" beams instead of a concrete foundation, the installation can actually be made and placed in operation in from 24 to 48 hours.

The water system for jacket cooling consists of a 2½-inch centrifugal pump mounted directly on the engine and driven from the engine crankshaft and two 1600 barrel steel tanks for water storage. However, on future installations a heat exchanger in either the oil suction or discharge line will be used, cooling the jacket water with crude oil, which is a much cheaper and more efficient system. This system of cooling is particularly desirable for installations where water supply is scarce or condition of water is not desirable for jacket cooling. As with the closed system, the engine can be operated on a small amount of soft water.

The overall mechanical efficiency is rather low in comparison with electric motor drive.

Engine M E — 80%
Pump M E — 75%
Gear Increaser M E — 98%
80 x 98 x 75 = 59% Overall M E.

This installation is interesting from the view point of portability, flexibility of operation, and quick installation. The greatest interest, however, is in its operation cost and its competitive position as a prime mover for pipe line pumping in flush fields. With this thought in mind the following tables have been prepared to show the investment, operating costs, fixed charges, depreciation, and the cost per KWH, using two, three, and five-year depreciation.

Table No. 1—Investment

Investment cost Diesel centrifugal unit, 25,000 barrels daily capacity at 450 pounds pressure, 75 per cent L. F.:

Engine—300 B HP	$12,000.00
Pump—6" 4 Stage	2,000.00
Gear Increaser	1,400.00
Couplings	350.00
Foundations 30 yds.	350.00
Building Steel 20x34	750.00
Heat exchanger	750.00
Oil Piping and Connections	5,000.00
Installation Labor	1,000.00
Miscellaneous Expenditures	1,500.00
Total	$25,100.00

Table No. 2—Annual Operating Cost

Maintenance—300 HP @ $4.00	$1,200.00
Fuel Oil .5 pound per B H P 2850 bbls @ $1.00 per bbl.	2,850.00
Lubricating oil 2000 B H P Hrs. Per Gal. 828.5 Gal. @ .60c per gal.	497.00
Rags, Packing and Miscl.	350.00
Overhead and Supervision 2%	502.00
Total	$5,399.00

Presented before Mid-Continent Section, A. S. M. E., March 10, 1932.

Table No. 3—Salvage Values and Annual Depreciation

Salvable Material	Initial Cost	Depreciation Period: Two Years Salvage Value	3 Years Salvage Value	5 Years Salvage Value	5 Years Total Dep.
Engine	$12,000.00	$10,200.00	$9,000.00	$7,800.00	35%
Gear Increaser	1,400.00	1,120.00	980.00	700.00	50%
Pump	2,000.00	1,700.00	1,500.00	1,300.00	35%
Couplings	350.00	280.00	280.00	280.00	20%
Heat Exchanger	750.00	525.00	412.50	187.50	75%
Pipe & Fittings	5,000.00	3,000.00	3,000.00	3,000.00	40%
Building	750.00	600.00	525.00	375.00	50%
Total Salvage Value		$17,425.00	$15,697.50	$13,642.50	
Complete Installation Cost		$25,100.00	$25,100.00	$25,100.00	
Less Salvage Value.		17,425.00	15,697.50	13,642.50	
Total Depreciation		$ 7,675.00	$ 9,402.50	$11,457.50	

Table No. 4—Total Fixed Charges

Depreciation Period	Per Cent Taxes, Ins. Interest	Amount Taxes, Ins. Interest	Amount Dep.	Total Annual Fixed Charges
2	7.5	$1,882.50	$3,837.50	$5,720.00
3	6.9	1,731.40	3,134.16	4,865.56
5	6.6	1,656.60	2,291.50	3,948.10

Table No. 5—Annual Operation Cost and Cost Per KWH

	2 Years	3 Years	5 Years
Annual Fixed Charges	$ 5,720.00	$ 4,865.56	$3,948.10
Annual Opr. Cost Unit	5,399.00	5,399.00	5,399.00
Total Annual Cost	$11,119.00	$10,264.00	$9,347.10
Barrels Oil Pumped per Year 6,850,000—Cost per Barrel	.00161	.00150	.00136
Cost per KWH	.00872	.00830	.00735

Total KWH per Year—1,275,744.

Advantages

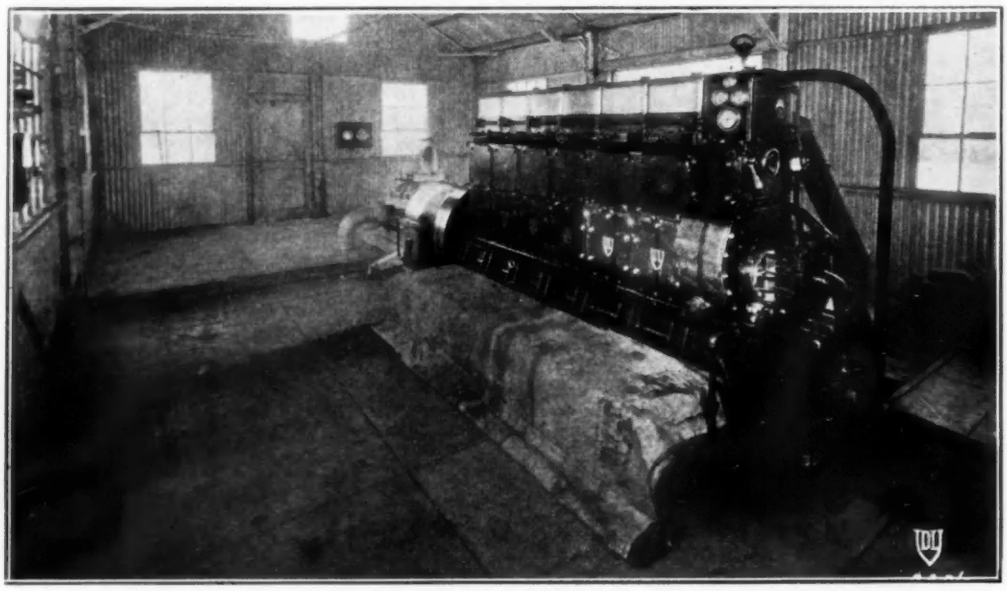
1. Low operation costs, being about half that of electric drive.
2. Variable speed, which is very essential in pipe line work.
3. Eliminates the payment of demand rate when not in operation as compared with many electrical installations.
4. Can be moved and erected in remote places where power lines are not available.
5. Quick installation.
6. Can be installed in places where water conditions are bad and operated on closed cooling system with small amount of soft water.

Disadvantages

1. Low overall efficiency.
2. High maintenance costs as compared to low speed engines and electrical motors.
3. Design of high speed engines not thoroughly proven.
4. Not as reliable as electric motor.

With the installation of the high speed Diesel engine and centrifugal pump, a material savings is effected in building space, foundation, piping and installation.

The writer believes that this type unit can be used particularly for field gathering stations. Such installations being more or less temporary, ranging in life from two to five years. Thus giving the user the benefit of low installation cost and continued low operating cost throughout the life of the station.



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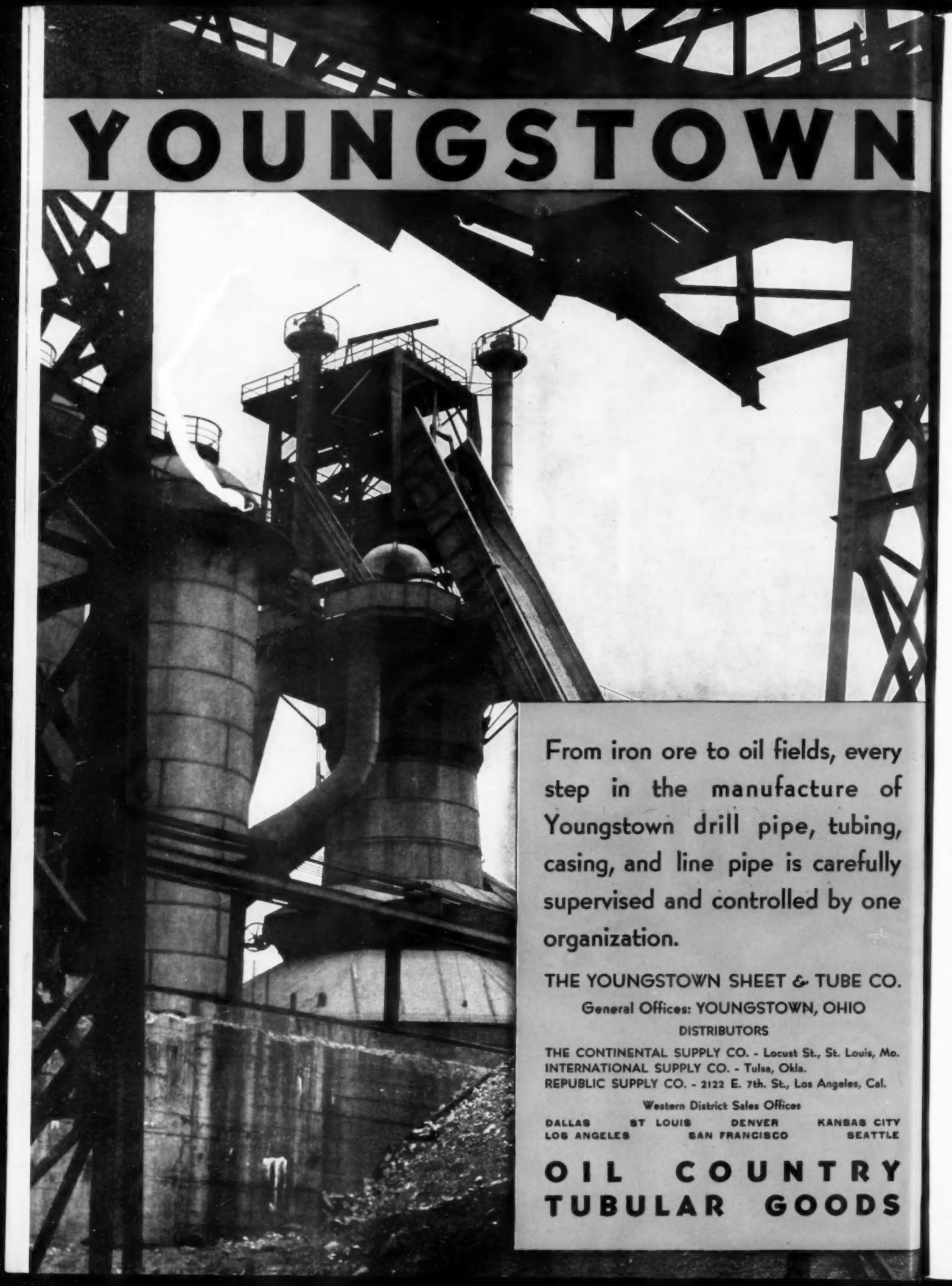

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OIL COUNTRY TUBULAR GOODS

Economics of Domestic Marketing

By SIDNEY SWENSRUD
Assistant to the President, Standard Oil Company of Ohio, Cleveland, Ohio

(Abstract of paper presented at New York Meeting of Petroleum Division, A. I. M. E., February 18, 1932)

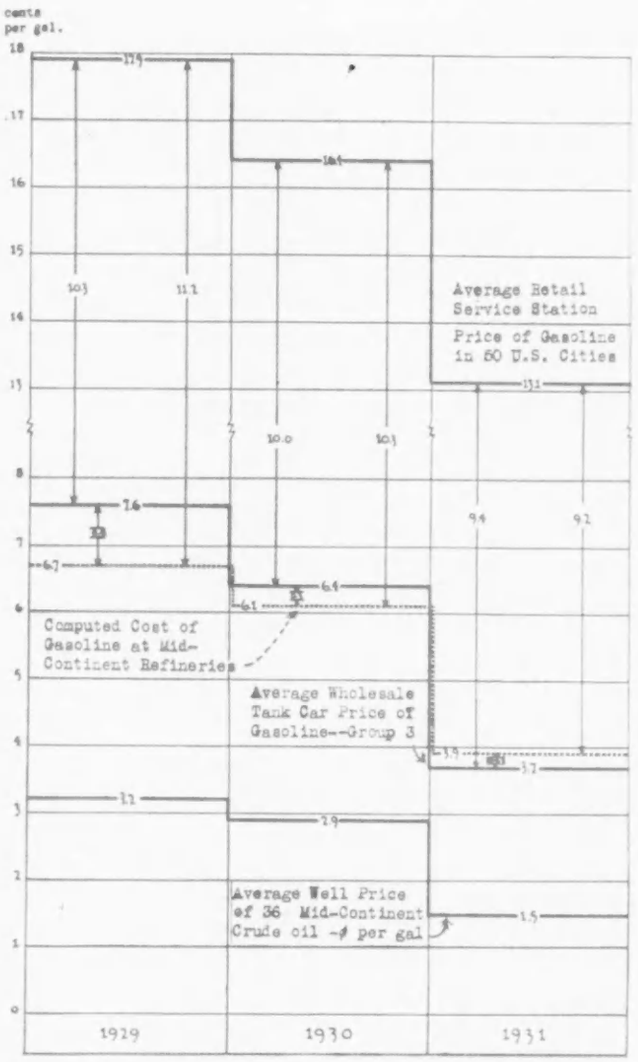
TO anyone even approximately familiar with the events of the last few years, the accompanying picture of prices will be recognized as the chronology of constantly increasing potential production of crude oil, climaxed in 1931 by the opening up of the now famous East Texas field. It is hardly necessary to dwell on the effect of 1931 prices on the average crude producer. Certainly the production department must have suffered most in 1931.

The lowest line in the accompanying chart shows the average posted well price in the Mid-Continent field of 36 gravity oil for each of the three years. In the next unbroken line above is shown the computed refinery cost of gasoline at Mid-Continent refineries. These gasoline cost figures have been computed by taking the average well price of 100 gallons of crude oil, adding an arbitrary $1.00 per 100 gallons for the cost of getting the crude to the refinery and processing it there, and from this total deducting the computed value of the by-products—that is, all products other than gasoline. These by-product values were arrived at by taking the average yield of each product per 100 gallons of crude for all refineries in the United States, as reported by the Bureau of Mines, and applying thereto the average Mid-Continent price quotations for each product. The total cost less the aggregate value of the by-products is then assumed to be the cost of finished gasoline produced. Dividing the net cost of the gasoline produced by the number of gasoline gallons, gives the computed cost per gallon of gasoline.

Refinery Margin Shrinks

It is of course obvious that the gasoline cost figures as thus determined for any one year are, at best, rough approximations, but it is believed that so far as measuring the difference between the several years is concerned, they are sufficiently accurate for our purpose here. The broken line shows the average wholesale tank car price in each year of U. S. motor gasoline in Group 3. The top line shows the average posted service station price, less tax, of ordinary motor gasoline in 50 representative cities of the United States. From this chart we may observe that in 1929 the wholesale price of gasoline appears to have been about 0.9 cents per gallon above the indicated refinery cost; in 1930, this margin of refinery profit had shrunk to 0.3 cents per gallon; in 1931, it has not only evaporated entirely, but has become less than nothing, since the wholesale price was less than the indicated refinery cost by about 0.2 cents per gallon.

It would appear from this picture that there has been a fairly well established downward trend in the margins which the refinery and marketing branches of the industry operate. This undoubtedly is due, in part, to the gen-



Comparative Crude Oil Prices; Retail and Wholesale Gasoline Prices, and Computed Refinery Cost of Gasoline, 1929 to 1931

erally declining price trend and the fact that gasoline prices declined ahead of crude oil, but that there also are at the events of 1931. A belated recognition of the economic work more fundamental factors is evident from a study of forces at work came with considerable suddenness in the late spring of last year when one major company announced it would market a third grade of gasoline at a price about two cents under the that of its "regular" brand, and on

which it would allow a dealer discount or agency commission of only one cent per gallon. Thus, with a bold stroke the company was enabled to meet the demand for lower prices without having to give the dealer a margin wider than could be afforded. At first there was much controversy over the wisdom of the third grade move, but whether from choice or otherwise, most major companies soon felt it expedient to adopt the plan. It marked the first official recognition of reduced total margins as an accepted fact. It marked also the first important attempt to reverse the trend of dealer margins.

Up to 1930 there had been relatively little attempt to give high anti-knock value to regular priced gasoline. But as the importance of high anti-knock became better understood and as automobile manufacturers went to higher compressions, the opportunity to capitalize on "anti-knock at regular prices" became increasingly tempting, and one company especially adopted it as a fixed policy. The movement grew and in 1931 many companies took definite steps to secure higher anti-knock qualities in their regular priced gasoline. The development of the octane number rating of anti-knock quality early in 1931 answered a long felt need for a definite standard of measurement. The improvement in anti-knock quality of ordinary gasoline has had a three-fold effect. First, it reduced the percentage of sales of premium price gasolines, on which wider margins existed; second, it increased the cost of manufacture without any corresponding increase in price; finally, it helped promote the third grade because it forced refiners to use their best anti-knock material for their regular grade.

Lube Prices an Economic Curiosity

During the past decade or so the prices of crude oil and of practically all of its products, except advertised brands of motor oil, have declined by more than 50 per cent. That the price of branded motor oils should have remained unchanged and even increased in many instances during this period is perhaps an economic curiosity. Doubtless, it is attributable in considerable measure to advertising. Generally speaking, too, the consumer has recognized the fallacy of saving money by buying cheap oil only to lose it many times over on extra repair bills. This has made him willing to pay extra for the assurance of high quality which he naturally associates with higher prices. The consumption of gasoline in 1931 held up very well. The motorist cannot skimp on it and still drive, but unfortunately this is not true of oil. I think that the ratio of oil sales to gasoline of most companies in the latter part of 1931 would indicate that not a few motorists had decided to buy oil on this theory. The improved quality of oil and the oil systems in modern automobiles, of course, also have tended to reduce the ratio of oil to gasoline sales. Competition has also been felt to an increasing degree in the motor oil market. The mail order houses, the department stores, automotive supply houses, hardware stores and the like, increasingly have been featuring oil, usually of alleged high quality, at prices of 50 to 60 cents per gallon. I would set 1931 down, therefore, as marking the conclusion of a certain era in the history of motor oil; a year which a certain disillusionment began—an unmistakable warning that in motor oil, as in gasoline, the dreary march toward narrower margins has commenced.

According to reports, about half of the gasoline sold at retail in Texas is on the credit card basis. This came about, presumably, because some company found that it could increase its business by distributing so-called "courtesy cards" in wholesale fashion. Other companies felt impelled to follow suit and so the practice became general. About half of the collections are reported to be constantly in arrears and large sums continually are written off. Imagine the cost of collection and losses, to say nothing of the bookkeeping expense—the cost of these items is estimated at 1½ cents a gallon. Does anyone claim that this is a sound practice, that it represents a justifiable use of credit, or that the industry serves the public well by adding 1½ cents a gallon to the cost of distribution? If there were a court of economic justice, this would probably be held an economic crime against society.

I am indeed convinced that the margins on gasoline and oil are likely to decline further, as more economical methods of marketing supersede some of the present methods. It seems to me that the experience of 1931 indicates that if the companies now enjoying most of the country's gasoline and oil distribution are to hold their relative position, they must guard against two things; first, the attempt to charge higher prices than can be maintained without diversion of worthwhile business to other types of outlets or other kinds of marketers, and in the second place, I believe they must guard against subdividing their business among still more outlets. There is no greater fallacy than for each company in the industry to assume that by increasing its number of outlets each will increase its total sales. To my mind, therefore, the healthiest thing for the marketing end of our industry to do would be to accept the inevitability of lower margins and try to anticipate their arrival by getting its marketing expense in line; get rid of the outlets which cannot pay their own way and abandon completely the practice of loaning equipment to anyone who wishes to become a dealer.

Barnsdall Corporation Eliminates Capitalization of Leases

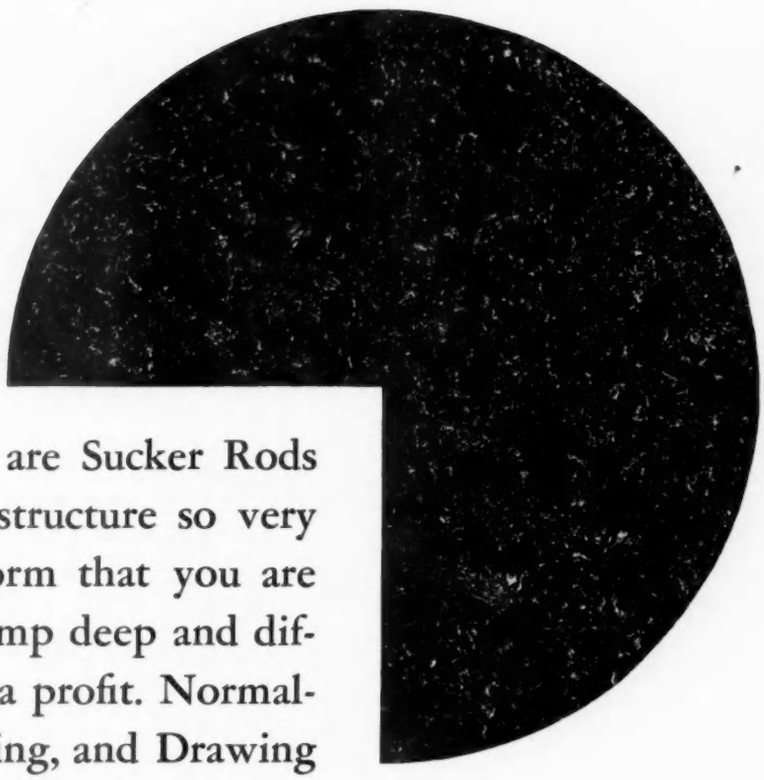
A new plan inaugurated by Barnsdall Corporation will charge all lease purchases to current earnings instead of capitalizing them and charging depletion out of earnings. The new plan contemplates the carrying of all investments in oil and gas leases on the consolidated balance sheet at $1.00, if stockholders at a special meeting to be held March 22 approve of a reduction in par value of the stock from $25.00 to $5.00 a share. The change in par would permit transfer from the capital account to surplus of $45,175,580.

E. B. Reeser, president, states that with oil and gas leases carried on the balance sheet at $1.00, the uncertainty of calculating depletion will be eliminated. The basis for such a charge against earnings is purely relative as engineers' reports on recoverable reserves of oil and gas are at best a fair estimate. Charges for property abandonment will also be eliminated in future earnings statements, which will be as nearly as possible a statement of cash earnings. During the past five years the company has charged against its earnings $10,290,611 for depletion and property abandonment. The write-off will in no way affect taxation, according to Mr. Reeser.

National Transit Earned $1.15 a Share

National Transit Company and subsidiaries report for the year ending December 31, 1931, showed a net profit of $588,355, equivalent to $1.15 a share on 509,000 shares outstanding. This compares with a net profit in 1930 of $609,400, or $1.19 a share. D. M. Sachs, president of the company stated in the report that the business of the parent company was not much affected by the prolonged economic disturbance. The movement of crude oil through lines of the company continued in good volume all year and during the last two months of the year the business was aided by the completion on November 1 of a program designed to materially increase the capacity of the trunk lines west.

PROFIT *by this*
REVOLUTIONARY ADVANCEMENT IN *SUCKER ROD* MANUFACTURE



Actual photomicrograph (100X) of grain structure after "Oilwell's" *Triple Treatment* to combine Strength, Toughness and Ductility.

Here, at last, are Sucker Rods with a grain structure so very fine and uniform that you are enabled to pump deep and difficult wells at a profit. Normalizing, Quenching, and Drawing are the *Triple Treatment* stages of refinement that make these Rods stronger, tougher and more ductile — enabling them to lower your lifting costs.

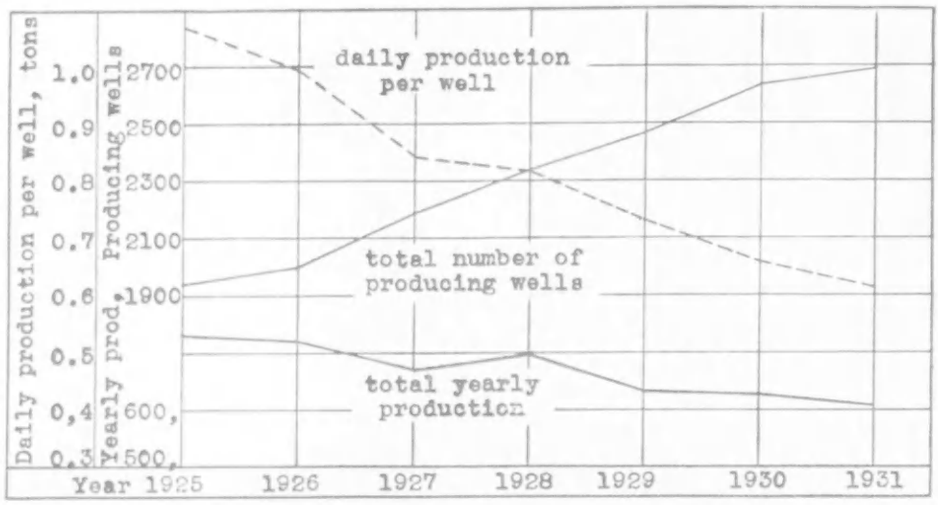
OIL WELL SUPPLY CO.
Branch Stores in all Oil Fields
SUBSIDIARY OF UNITED STATES STEEL CORPORATION

IT'S FROM OILWELL

"OILWELL'S"
Triple Treatment

1835

"OILWELL"



Further Decline of Polish Crude Production

By T. S. SZWABOWICZ
Petroleum Engineer, Bitkow, Poland

POLAND'S estimated crude oil production during 1931 was 608,000 metric tons compared with 628,557 tons in 1930; decline of 20,500 tons was 3.2 per cent of total. This was not unexpected as the number of completions was considerably below that in 1930 (Table 2). Total number of producing wells was only slightly higher than during the preceding period, while the daily average production per well reached a new low mark of 613 kilos per well (around 4.1 barrels).

The Boryslaw district declined from 443,340 tons to 397,000 tons, i. e. it lost 46,500 tons during the year. This drop was much sharper than in 1930 when it was only 27,000 tons; thus the country's greatest oil field was the only cause of lower total. Other fields, however, due to somewhat increased activity were partly able to offset this decline of production.

Boryslaw with its peak of production of 1,900,000 tons in 1909 is now hardly making one-fifth of its maximum. Present rate of completions (15 in 1931) is not sufficient to maintain declining output. Encroachment of edge water and very low rock pressure, both caused by defective methods of development in the past, are very rapidly nearing the economic limit of the district. Unless an extension of this field is found, further decline, perhaps still greater, is imminent during 1932. Operators aware of such conditions are turning toward other shallower fields requiring less investment and at the same time offering more sure returns.

Small Operators Gaining Importance

Practically all oil fields, outside Boryslaw, are able to increase production so that they can largely offset the decline coming from this latter district; of course, a good deal of development is necessary. From a few years there has been a trend towards increasing activities in smaller fields rather than in Boryslaw, and results of such an action are already noticeable. Another interesting feature is that in the Boryslaw district larger companies are beginning to increase the number of wells that are being leased out to smaller operators who are not only able to pay rent to the owners, but also can run these wells with reasonable profit. Other fields are developed and operated rather by smaller companies than by the larger ones. These latter are carrying too high overhead expenses and cannot successfully compete with the smaller units. There are known a few cases where the big companies are maintaining large office forces in different cities (for instance in Vienna, Paris, Warsaw, Lwow and Boryslaw). Naturally small production of ageing fields is not sufficient to pay both the salaries of large "hierarchies" of directors, and dividends to the stockholders. Besides this, large companies, especially the French ones, consider the regular field work on their leases as a side issue, and prefer to speculate with their shares. With such conditions smaller operators are having more chances for profitful development of all oil fields.

Of course, technical progress is much slower, when smaller capital is engaged. This is still responsible for a great number of shallow wells that are manually pumped and bailed, and sometimes even drilled.

Natural Gasoline Steady

Production of natural gas showed a loss of 14,000,000 cubic meters, and the amount of treated gas declined by 7,000,000 cubic meters, which represented a drop of 3.8 per cent and 2.5 per cent respectively. However, production of natural gasoline was slightly greater than in 1930. Higher gasoline output per 100 cubic meters of treated gas was entirely responsible for increase of production. Improvement of extraction methods, and ever increasing contents of natural gasoline in gas coming from ageing oil fields, resulted in better recovery.

Entire amount of produced natural gasoline was consumed within the country. Bulk of this product went to the

TABLE 1
Poland's Yearly Production Demand and Stocks
(Metric tons)

Year	Production[1]	Demand	Stocks at the end of the year[2]
1927	669,509	669,916	not available
1928	694,362	696,041	not available
1929	632,996	636,216	45,977
1930	628,557	629,503	56,820
1931	608,087[1]	590,784[1]	74,123[1]

[1] Estimated.
[2] Stocks at the refineries included.

TABLE 2
Number of Wells Completed, Daily Initial Production, and Daily Production per Well

Year	Wells completed*			Initial production kilos	Total number of producing wells	Daily production per well kilos
	Oil	Gas	Dry			
1927	123	5	40	8,349	2,183	840
1928	167	6	34	5,430	2,332	815
1929	176	10	33	4,930	2,460	727
1930	230	5	52	4,399	2,624	656
1931	186	5	23	3,018	2,690	613

* Recompleted wells included.

TABLE 3
Domestic Consumption of Refined Products
(Metric tons)

Year	Gasoline	Kerosene	Gas Oil	Heavy and light oil	Other products	Total
1927	50,465	149,374	46,041	62,482	49,350	359,712
1928	69,405	147,895	55,396	62,205	32,688	373,208
1929	89,430	153,670	63,790	59,290	48,278	414,458
1930	98,137	145,489	72,132	51,131	42,318	409,207
1931	85,500	122,850	60,600	42,000	50,000	360,950
	Export of Refined Products					
1927	62,186	49,403	58,404	42,259	58,151	270,403
1928	61,758	41,436	62,034	35,868	59,381	260,477
1929	43,930	57,173	61,443	41,031	45,191	248,768
1930	40,984	30,167	44,231	37,549	39,243	192,174
1931	67,440	31,280	43,370	28,170	39,080	209,340

TABLE 4
Production, Consumption and Export of Natural Gasoline

Year	Production of natural gas (in 1000 cb. m.	Gas treated	output in kilos per 100 cb. m.	Production of natural gasoline (in	Domestic consumption metric	Export tons)
1927	453,322	248,395	11.2	27,784	25,233	1,133
1928	459,531	259,205	12.03	31,855	29,882	860
1929	466,683	277,082	12.45	34,504	32,647	628
1930	486,506	286,051	13.55	38,764	37,596	12
1931	472,500	279,060	14.54	40,577	40,706	..

refineries for blending with heavier gasoline received from distillation of crude.

Domestic consumption of refined products dropped to 360,450 tons against 409,207 tons in 1930, while export increased from 192,174 tons to 209,340 tons. Domestic consumption was 12 per cent lower than in the preceding year, and attained level that was even lower than in 1926. Increase of export could not make up for slackened consumption which was affected by many factors. World wide crisis was one of them. A very burdensome tax imposed on all kinds of motor vehicles can be considered as another cause of lower consumption. Number of automobiles during 1931 decreased five per cent compared with the previous year, and hovered around 40,000.

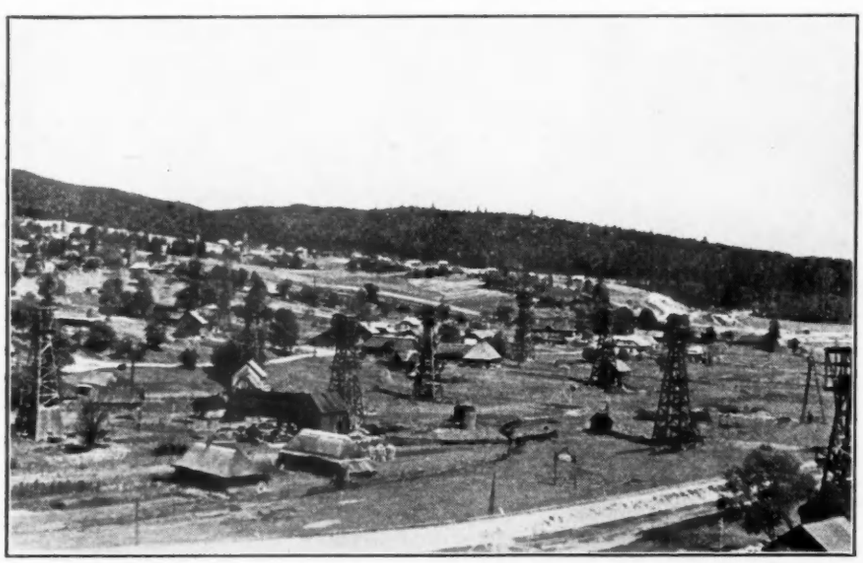
During the coming year the government is endeavoring to increase the existing duty on imported automobiles. Under the new tariff a duty on Ford passenger car would be about $1,100.00 which should render the total price entirely prohibitive. Another sort of danger is looming from a new law about compulsory admixing alcohol to gasoline. This projected law is meant to help farmers, but at the same time may prove very harmful to the petroleum industry. If the diet accepts both the new duty on automobiles, and proposed law about use alcohol-gasoline mixture, and if the heretofore levied tax is not reduced, number of motor vehicles in 1932 will rapidly decrease, and domestic consumption of gasoline will be very poor.

Kerosene was another product, besides gasoline, that influenced lower consumption. Greater use of electric current for lighting homes was important factor in diminishing use of kerosene.

There are all indications that demand in 1932 will be still lower. Fortunately crude production is expected to stage further decline which will prevent excessive increase of stocks: Export cannot be relied upon, because it is a mere dumping below costs. It represents loss, and the refiners resort to it in order to get rid of increasing stocks.

Crude oil stocks in 1931 increased by 17,000 tons, and at the end of September they amounted to 74,123 tons. Stocks of refined products reached the new level of 240,852 tons, i. e. they were 25,817 tons higher than at the end of 1930. Increase of stocks was reflected in several crude price cuts. Prices ranged from $170.00 to $370.00 per 10 ton lots at the beginning of the year, and in October they were from $160.00 to $340.00. The same prices expressed in barrel terms were from $2.45 to $5.25 and from $2.30 to $4.80 per barrel, respectively. The Boryslaw crude was cut from $215.00 to $186.09 per 10 tons, or from $3.07 to $2.66 per barrel. Heavier crudes were affected to a much smaller degree (about 15 cents per barrel) by price cut, than lighter ones (about 45 cents). This could be explained by a considerably lower demand for gasoline and kerosene. Cheaper crude did not practically influence the price structure of refined products. Gasoline was sold at nine cents per liter, or 34 cents per gallon, and kerosene at 5.7 cents per liter or 21.4 cents per gallon.

It is very likely that prices during 1932 will be subject to another adjustment, if demand does not pick up. The existing stocks of both crude and refined products are sufficiently large to supply the country for about 10 months. Even if exports are included there is still enough for half of the year.



Majdan, a shallow oil field and one of the smallest in Poland

BIG LAKE OIL COMPANY

Producers of

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CRUDE OIL

and

NATURAL GASOLINE

Executive Offices
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Field Offices
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The Physical Characteristics Of Mud Fluids

By RICHARD C. KERR
Los Angeles, California

THIRD INSTALLMENT

TWO previous installments of this three-part discussion of rotary drilling muds have dealt with weight and viscosity. The present installment further deals with the several physical properties of mud and maintenance of the fluid at the desired consistency throughout the drilling operation.

This discussion covers the various elements that enter into the physical make-up of a mud fluid, an understanding of which is a great aid to the handling of the material in ordinary practice

CERTAIN sandy and porous formations subtract colloidal matter from the mud by filtration into the walls. In such cases the continual addition of small quantities of active colloidal clay or bentonite will make good the loss.

More frequently there is sufficient clay in the formation to over supply the mud and continuous dilution with water is required to hold the viscosity to a reasonably low limit.

As a matter of economy, when it is desired to add viscous material to the drilling mud, it is frequently better to pay a relatively high price for a material with high colloidal content than to purchase cheap muds with a low colloidal content.

Plasticity and Yield Value of Colloidal Liquids—In the study of the viscosity of colloidal systems early workers in the field discovered a radical difference in the relationship between shearing stress and the resulting volume of flow as shown by true fluids and colloidal liquids.

For instance, in measuring the rate of flow of true fluids through capillary tubes it is found that the volume of fluid flowing through the tube varies in direct proportion to the pressure forcing it through. With colloidal systems, however, the volume of flow at very low pressure is very small and if the pressure were increased the volume of flow increases at a rate more rapid than the pressure change would seem to warrant. This characteristic was studied by Bingham[12] and a chapter in his book is devoted to the subject.

Bingham's conclusion was as follows: This change in rate of flow is not due to a change in the viscosity of the colloidal system under variable rates of flow but is due to another characteristic which he called plasticity.

Plasticity he defined as "a property of solids in virtue of which they hold their shapes permanently under the action of small shearing stresses but they are readily deformed, worked or moulded, under somewhat larger stresses."

Bingham has carried his concept of plasticity of a solid over into the concept of plasticity of a fluid when the solid has been dispersed into a liquid, forming a colloidal system.

This is rather a difficult concept to follow and it is unfortunate that the term plasticity should have been used at all. The term has been widely used in the literature and in discussion on mud fluids in the United States, but little endeavor has been made to give it a special significance when used in discussions on fluids as opposed to the ordinary conception of plasticity as a property of solids.

Bingham[12] considers that plastic substances have "apparent viscosity" which is really the sum of true viscosity plus plasticity.

This definition necessitates a consideration of the definitions of fluids and solids. Bingham[12] quotes Maxwell's defi-

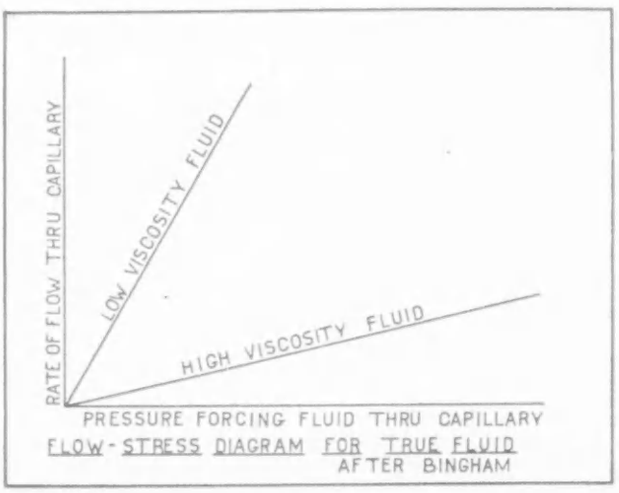


FIGURE 5

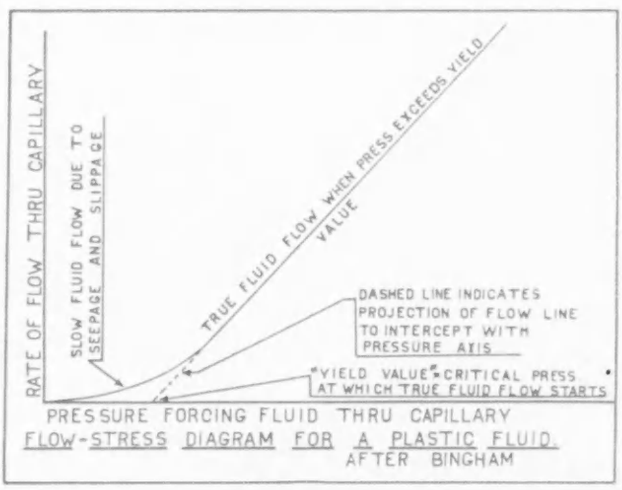

RATE OF FLOW THRU CAPILLARY
SLOW FLUID FLOW DUE TO SEEPAGE AND SLIPPAGE
TRUE FLUID FLOW WHEN PRESS EXCEEDS YIELD VALUE
DASHED LINE INDICATES PROJECTION OF FLOW LINE TO INTERCEPT WITH PRESSURE AXIS
"YIELD VALUE"=CRITICAL PRESS AT WHICH TRUE FLUID FLOW STARTS
PRESSURE FORCING FLUID THRU CAPILLARY
FLOW-STRESS DIAGRAM FOR A PLASTIC FLUID
AFTER BINGHAM

FIGURE 6

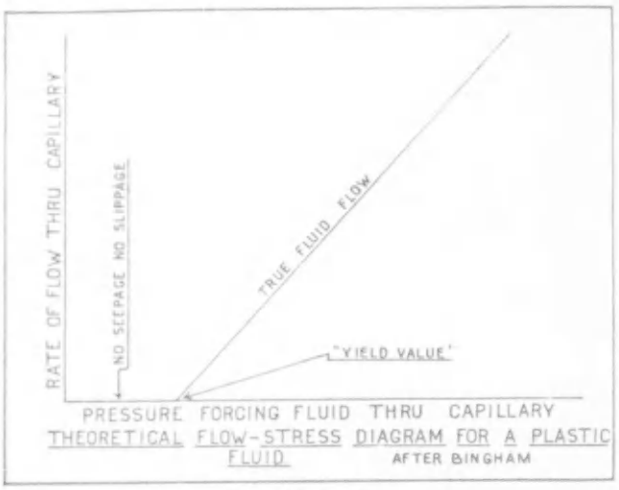

RATE OF FLOW THRU CAPILLARY
NO SEEPAGE NO SLIPPAGE
TRUE FLUID FLOW
"YIELD VALUE"
PRESSURE FORCING FLUID THRU CAPILLARY
THEORETICAL FLOW-STRESS DIAGRAM FOR A PLASTIC FLUID
AFTER BINGHAM

FIGURE 7

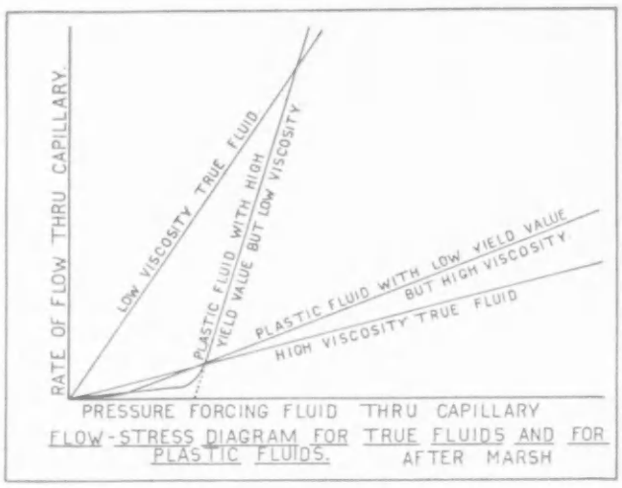

RATE OF FLOW THRU CAPILLARY
LOW VISCOSITY TRUE FLUID
PLASTIC FLUID WITH HIGH YIELD VALUE BUT LOW VISCOSITY
PLASTIC FLUID WITH LOW YIELD VALUE BUT HIGH VISCOSITY
HIGH VISCOSITY TRUE FLUID
PRESSURE FORCING FLUID THRU CAPILLARY
FLOW-STRESS DIAGRAM FOR TRUE FLUIDS AND FOR PLASTIC FLUIDS.
AFTER MARSH

FIGURE 8

nition of a solid as a material in which a "continuous alteration of form is only produced by stresses exceeding a certain value, however soft it may be."

A fluid is defined as a substance in which "the very smallest stress, if continued long enough will cause a constantly increasing change of form however hard it may be." Glass and sealing wax are representatives of a hard but true fluid. Butter and tallow are soft but true solids.

Bingham[12] has plotted his experimental data in a series of (volume of flow) (shearing stress) diagrams which graphically show his interpretation of the laboratory results.

Figure 5 is a modification of Bingham's diagram showing the shearing stress—volume of flow curve for various true fluids.

Figure 6 is a modification of a diagram presented by the flow-stress curves for a plastic fluid.

Analysis of these curves lead Bingham to propose his theory of plastic flow in colloidal systems.

The theory may be summarized as follows: The plastic substance (solid, semi-solid or liquid) has a certain rigidity that permits it to resist flow up to its elastic limit. When this elastic limit is exceeded by the shearing stress the substance yields and under increasing stress true fluid flow takes place.

In its simplest form the curve for this condition will be as shown in Figure 7 which is a modification of one of Bingham's diagrams.

As shown in Figure 6, this theoretical curve has not been obtained in the laboratory and some flow is found to take place at pressures far below the yield value.

This low pressure viscous flow is explained by Bingham as due to seepage and slippage.

Seepage, he defines as a slow flow or filtration of the liquid part of the colloidal system through the solid particles.

Slippage, he decides is due to a lubrication of the walls of the tube by the liquid part of the system so that movement takes place not by deformation of the substance but by sliding on the walls of the container.

Bingham deduces from his data that the flow above the yield value is true fluid flow and that his curves become straight lines above that value.

The curves upon which Bingham based his conclusion have been reviewed by Marsh[7] and he presents a set of curves which graphically summarize the theory and emphasize several important points.

Figure 8 is a modification of Marsh's graph. These curves are idealized but are based on very similar curves developed by Bingham experimentally.

The publication of Bingham's book in 1922 created considerable comment and his theories have not been universally accepted.

Emil Hatschek[13] of the John Cass Technical Institute, in particular, takes the stand that there is really no reason why the viscosity coefficient need be always a constant, that it is reasonable to expect a variation in viscosity coefficient with variations in the rates of flow (velocity gradient) in colloidal systems.

This view is shared by most European investigators and Hatschek cites numerous references to substantiate his objection. He further states that the experimental work of numerous European workers have failed to check the result reported by Bingham.

Their work indicates that these curves are smooth and continuously curving and that there is no straight line portion although the curve gradually flattens out. There is, thus, no straight line intercept possible on the pressure axis and therefore no "yield value" can be determined.

Hatschek's objections seem to be well-founded and a considerable mass of evidence is presented to substantiate his claims.

Figure 9 is a modification of a diagram presented by

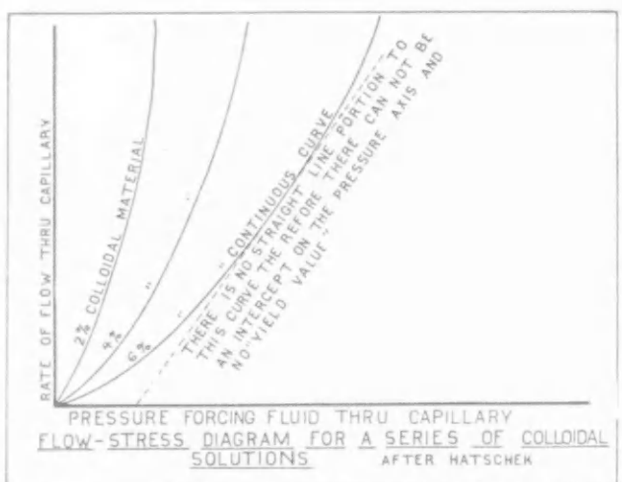
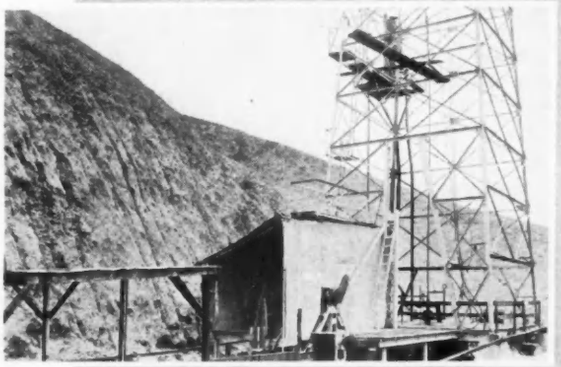

RATE OF FLOW THRU CAPILLARY
2% COLLOIDAL MATERIAL
4%
6%
"CONTINUOUS CURVE"
THERE IS NO STRAIGHT LINE PORTION TO THIS CURVE THEREFORE THERE CAN NOT BE AN INTERCEPT ON THE PRESSURE AXIS AND NO YIELD VALUE
PRESSURE FORCING FLUID THRU CAPILLARY
FLOW-STRESS DIAGRAM FOR A SERIES OF COLLOIDAL SOLUTIONS
AFTER HATSCHEK

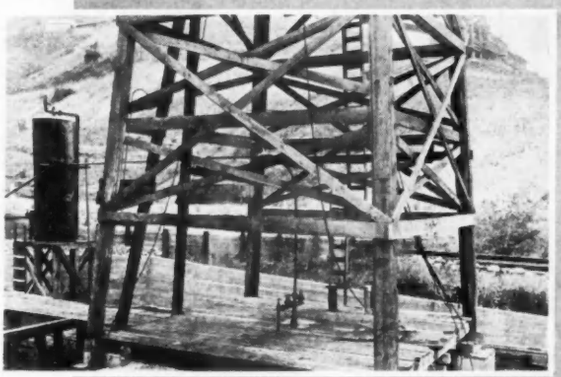
FIGURE 9

5105 feet deep, and has been operating on a "JAT" Oilift Displacement Pump for over 3 years. Production—245 barrels of 25 gravity oil, cutting 10%.



5376 feet deep, and has been operating on a "JAT" Oilift Displacement Pump for almost 3 years. Production—240 barrels of 25 gravity oil, cutting 5%.

4350 feet deep, and has been operating on a "JAT" Oilift Displacement Pump for over 2½ years. Production—190 barrels of 34 gravity oil, cutting 31%.



4700 feet deep, and has been operating on a "JAT" Oiliit Displacement Pump for over 2 years. Production—330 barrels of 27 gravity oil, cutting 3/10 of 1%.

"JAT"

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PUMPING SYSTEM

eliminates beam pumping equipment and the usual standard end of derrick.

"JAT" Pumping System is reducing lifting costs daily for the operators of these four wells.

"JAT" Oilift Displacement Pumps are now producing wells from 2000 to 8000 feet deep.

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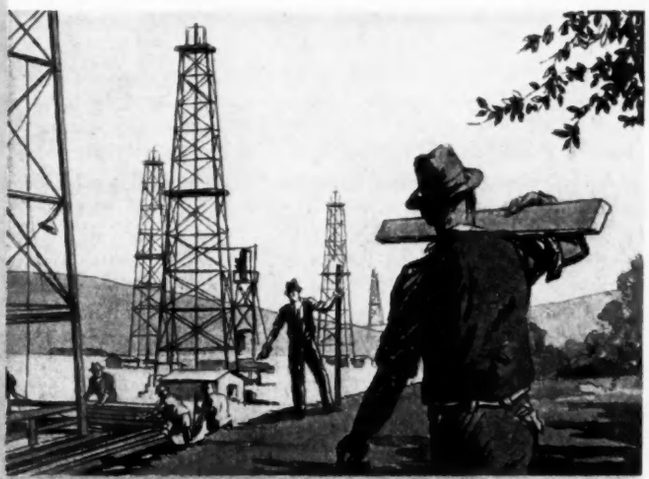

Hatschek showing typical curves for a series of starch paste systems.

These curves are continuously curving and have no straight line portions.

Summary on Plasticity and Yield Value — Whether Bingham[12] is right or wrong in his theory regarding the plasticity and yield value, the fact remains that in colloidal systems there is a definite decrease in apparent viscosity with increase in rate of flow and this fact may be of importance in many of our considerations of the action of drilling mud fluids.

Bingham offers us no units in which the report plasticity in liquid systems and no means of measuring the same.

Both plasticity and yield value in liquid systems lack physical meaning. They are purely theoretical concepts and as such are of doubtful value to us in our practical work.

Under the circumstances, since there is such violent disagreement among the specialists in regard to this matter, and since both these terms are difficult to determine and measure, it is suggested that we eliminate them until further experimental work shall have proven or disproven their existence.

It is certainly desirable to eliminate all unnecessary or indefinable terms from the non-technical literature and from field discussions in order to simplify the problem of imparting the desired information to the field men.

In addition to that the term is directly in conflict with and likely to be confused with the familiar and useful concept of plasticity of solid and semi-solid mud masses.

Plasticity, as defined by Bingham[12] for colloidal systems in the liquid state, has nothing to do with the plastering action of muds on the walls of the hole.

The mud that builds up on the walls of the hole becomes a plastic solid and as such has real physical plasticity capable of being worked and moulded and pressed into the walls, and capable of forming a smooth, tough, well-lubricated hole wall.

This solid plasticity is a tangible physical property and plays an important part in the successful drilling of the well. It is something that the field man understands and utilizes and should not be confused with the "plasticity" of fluid colloidal systems.

Plasticity of Solid Mud—Plasticity in the solid mud is a very important property. It is the property of the solid mud to cling into workable, mouldable masses.

It is the property that causes clay to ball up on the bit while drilling and causes the mud fluid to form tough, slick impervious filter packs around the walls of the hole.

In this respect it is proper to refer to the plasticity of the solid colloidal matter from which the mud is formed and when this colloidal solid portion is isolated it can be moulded, worked or formed at will in testing its plasticity.

W. A. Stout[14] has demonstrated a method of testing the plasticity of the solid portion of a drilling mud. Stout uses a small slab of dry cast plaster of Paris. One end of the dry slab is placed into the mud fluid for a few moments and then removed. The plaster of Paris slab is found to have a thin coating of mud clinging to the previously submerged surface. The water in this mud is rapidly sucked out by the plaster of Paris leaving a firm semi-solid filter cake of mud on the surface.

If this filter cake is slick, tenacious and sticky, the solid part of the mud fluid is highly plastic and will possess good wall building quality.

If the filter cake is dry, crumbly and rough, the mud fluid is loaded with inert non-colloidal matter and will have very poor penetrating and wall building properties.

In testing dry mud for desirability as a drilling mud, work the material up into a stiff paste and test it for smoothness, stickiness and tenacity, according to any of the accepted methods and finally mix to the desired mud fluid consistency and test with the plaster of Paris slab.

A dry mud that works up into a tough, sticky tenacious ball, capable of being readily formed and moulded should yield a good mud fluid.

The dry mud that works up into a crumbly, non-tenacious mass that will not form tough easily moulded forms will not yield a good drilling mud.

The use of the term plasticity to define this property of the solid mud is well founded and has a real physical meaning, and the emphasis of this meaning is to be highly desired. The recognition of the property by the field man is highly important and it should be clearly presented to him.

Liquid States

Mud fluid is a complex fluid mixture and can be separated into the following fluid states:

1. Mechanical Suspensions.
2. Colloidal Solutions.
3. True Molecular Solutions.

Mechanical Suspensions—Mechanical suspensions are mixtures of undissolved fragments, grains or particles of some solid substance, held in suspension in a liquid base. This suspension may be of temporary duration, if the fragments settle out rapidly.

The solid particles are known as suspensoids and range in size from coarse visible fragments down through finer and finer grains to about the lower limit of microscopic visibility, in the neighborhood of 10^{-4} cm. diameter.

With further reduction in size the suspensoids take on the characteristics of colloids.

Gravel, sand, shale, chips, rock dust and weight material grains are the most common suspensoids to be found in rotary mud and are, of course, of great importance in determining the physical character of the mud.

They determine the abrasive action, and the specific gravity of the mud, and influence the plastering and the penetration action on the walls of the hole.

Coarse material or abrasive material of larger than 300 mesh size, should never be recirculated if it is possible to remove it.

Very fine non-abrasive material is a common and necessary constituent of good mud. Finely ground weight material or the inert matter in ordinary clay is of value for its property of increasing the specific gravity without materially increasing the viscosity of a mud fluid.

Fairly fluid muds up to 130 pounds per cubic foot (2.09 Sp. Gr.-17.4 lbs. gal.) have been prepared by mixing solutions of finely ground high specific gravity compounds without colloidal material.

Colloidal Solutions

Dispersion—The dispersed solid particles of a colloidal solution range from 10^{-5} to 10^{-7} cm. in diameter, which corresponds approximately to the range of visibility of the ultra microscope.

It is now generally accepted that the colloidal condition does not have anything to do with the chemical make-up of the matter involved, but deals only with the fineness of the dispersed solid particles.

There are no sharp limits to the colloidal state. The colloidal characteristics reach a maximum at about 10^{-6} cm. dispersed particle diameter and fade out into the characteristics of coarse mechanical suspensions with increase in

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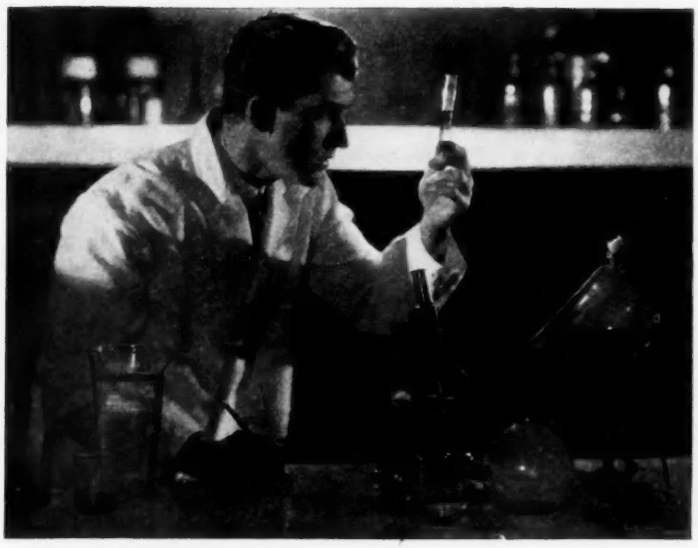
A Personal Word

I felt this was a pretty good way to say 'howdy' to old friends, customers and acquaintances in the oil industry. I hope many of you will accept my cordial invitation to drop in to our new offices, or to send me a line. Naturally, I want you to know more about the Atlas Sales Corporation; its growing line of quality oil field specialties, and above all, about my pet product... Fissure Drilling Compound. And take my tip...don't delay getting the full story on the compound.

Roy Guthrie

GENERAL MANAGER



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diameter above 10^{-5} cm., and into the characteristics of true molecular solutions with decrease in diameter below 10^{-7} cm.

The physical characteristics of colloidal solutions that we are most concerned with in mud fluid discussions are

1. Viscosity,
2. Specific gravity,
3. Plasticity of the solid matter,
4. Dispersion,
5. Jelling action.
6. Penetration of wall.

Viscosity—All true colloids have the property of producing highly viscous liquids with only small percentages of the colloidal material in solution. Thus when we wish to increase the viscosity of our mud, we may easily do so by adding a small percentage of a suitable active colloidal material. If we wish to decrease the viscosity, we must thin with water and then rebuild the weight with inert suspensoid material, thus reducing the percentage of colloidal material.

A total content of 4 per cent of bentonite in water will produce a fluid of as high a viscosity as could be obtained by adding 60 per cent of inert matter to water.

Too high viscosity is generally a serious defect in rotary mud and care must be exercised in adding colloidal matter that too high a viscosity is not obtained.

Specific gravity—Active colloidal material can not be added in sufficient quantity to materially increase the specific gravity without making the fluid extremely viscous.

Plastering action—When the solid particles in the mud are filtered out and separated as a plastic solid filter pack on the walls of the hole it is the colloidal matter that gives it tenacity, toughness and slickness. This very important property is the primary reason for desiring the proper content of active colloidal matter in the mud.

Penetrating action—Colloidal particles being of such small size will naturally penetrate deeper into the walls of the hole before building up a solid filter pack than will the suspensoids.

Settling action—True colloidal matter is dispersed evenly throughout the liquid and will not settle on standing.

Dispersion—The extremely fine state of subdivision of the dispersed colloidal particles in drilling mud has resulted in an enormous increase in surface area of the solid material. This increase in surface area has an important bearing on the adsorption of gas by the mud, and an equally important effect in absorption and retaining of certain chemicals from the liquid phase of the mud.

Flocculation—Under heat, agitation, shock, electric and chemical treatment dispersed colloids may be made to coagulate or flocculate. The irreversible colloids once flocculated remain so and cannot be dispersed again. The reversible colloids will deflocculate or redisperse when the flocculating conditions are neutralized.

Clays and bentonites are generally reversible and when flocculated by chemical agents may be redispersed by proper treatment.

Flocculated colloids solutions lose many of their colloidal characteristics. Viscosity is lowered, and jelling action is lost.

The flocculated material will not penetrate the walls of the hole, but it will build up a tough, sticky, filter pack on the walls, which after all is one of the primary functions of the mud fluid. This filter pack will not be as firmly rooted to the wall, however, as if the pack were built up from dispersed colloidal material.

The flocculated material settles out and collects in the bottom of the container or in the hole as a more or less thick viscous mass leaving clear water above, and a more or less firm solid cake on the bottom.

There are times when flocculated mud is desirable and it is probably not a serious matter in most cases.

True molecular solutions are those in which one or more soluble chemical substances are dissolved in a liquid base in particles of less than 10^{-7} cm. diameter.

The waters used in preparing mud fluids contain many chemical substances that are completely dissolved. In general, however, the concentration of such chemicals is so low that the physical characteristics of the solution, such as viscosity, specific gravity, surface tension, etc., are not materially different from pure water.

These dissolved chemicals do have an important effect on the colloidal content of the mud and may cause precipitation and flocculation.

C. P. Parsons[16] of Halliburton laboratories has presented valuable data on the floculating or settling action of various concentrations of dissolved chemicals in the water that is used to mix the mud fluids. A surprising feature of this data was the fact that minimum settling of the samples selected occurred when the solution was slightly acid.

Jelling Action

A great deal has been written on the jelling action of certain colloidal mud materials, and considerable laboratory work has been done along that line.

There is, however, considerable doubt as to the exact process involved, and considerable difference of opinion among the workers in this problem as to whether or not the action is truly one of jelling.

There is no doubt as to the formation of a jell-like structure however, and laboratory work is now in progress that will no doubt yield interesting results in the near future.

This problem is extremely important, as jelling action has a direct influence on the removal of cuttings from the hole and on the settling out of the cuttings at the surface.

Rideal[10] in a new book on surface chemistry, has devoted a considerable part of his book to jelling and has presented the subject in an impressive style.

Mechanical Analysis

Coarse particles in suspension have a great deal to do with the determination of the physical characteristics of a mud.

Hard abrasive material of coarser than 300 mesh size is highly undesirable; fine sharp sand of larger than this rapidly wears out pump liners and packing, eats out fittings and connections, and seriously interferes with the penetration of the colloidal portion of the mud into the formation.

Removal of such a fine hard abrasive material is one of the most important problems in rotary mud work and is receiving a great deal of attention and study.

Abrasive material coarser than 100 mesh is frequently to be found in unregulated rotary muds and the industry has paid millions of dollars for material and labor in repairing pumps, swivels and hose ruined by such material, to say nothing of other serious and expensive troubles that are caused.

Chips and balls of soft shale and clay are undesirable but are not capable of doing the damage that hard material is. When circulating very thick mud the writer has observed cases in which clay lumps have been produced in such quantities as to fill the suction pit and to choke the pump suctions, thus temporarily stopping circulation. The addition of clear water and mixing in large pits with mud guns or large mechanical agitators will rapidly break up such lumps.

These lumps are formed because the mud is already so thick with colloidal matter that it is hard or impossible to force more clay into solution. It is a supersaturated solution of clay.

Coarse mechanical suspensions contribute greatly to the specific gravity of a mud fluid and sand loading may run

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without redressing

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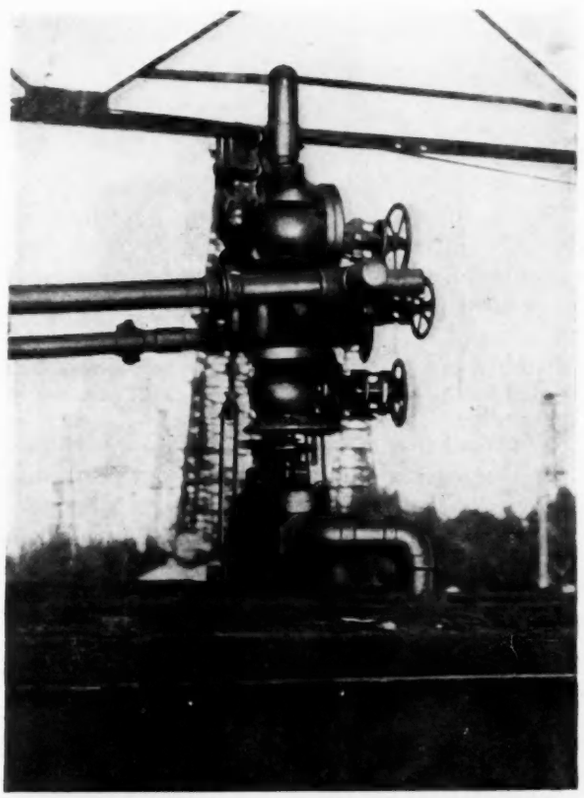

A 12-in. bit set with Haystellite and faced with Haystellite-Composite Rod drilled 1,312 feet near Damon, Texas, and was only 1/8 in. out of gauge when pulled.

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Haystellite and Haystellite-Composite Rod can be applied by welding to practically all types of drilling tools. If you are interested in drilling straighter holes faster and at lower cost, write today for further information.

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Haynes Stellite products are available also through the 42 apparatus shipping points of The Linde Air Products Company

the mud weight up as high as 90 pounds per cubic foot. (1.44 Sp. Gr.—12 pounds gal).

Harvey Lytel[17] of General Petroleum Company's engineering department has worked out a settling test for suspended material, by diluting 100 cc. of mud with 400 cc. of water in a 500 cc. graduate and making a volumetric determination of the settlings. Centrifuging will yield a similar result, but the dilution and settling tests is easily performed with a minimum of apparatus and effort.

Minor Physical Properties

Surface tension—Surface tension should have an important effect on the depth of penetration of the mud fluid into the wall formations, which are already wet with water or oil, or are dry, but very little has been published on the subject. There is a tendency for us to assume that the surface tension has not materially changed from that of water.

Coarse suspensoids do not have much effect on the surface tension of the fluid but many colloids do have an important effect.

The familiar example of the lowering of the surface tension of water by the addition of small percentages of soap is familiar to all, and a certain amount of research in surface tension might lead to interesting results.

Color—The ideal mud fluid should be of light color, in order that dark colored oils will more readily show up on its surface, and so that the rainbow colors of high gravity oils may be more readily observed.

[12]Bingham, Eugene C., "Fluidity and Plasticity." A text book, McGraw-Hill, 1922.
[13]Hatschek, Emil, "The Viscosity of Liquid." A text book, G. Bell & Sons, Ltd., London, 1928.
[14]Personal Communication, 1931.
[16]C. P. Parsons, of Halliburton Oil Well Cementing Co. Labs., "Characteristics of Drill Mud Fluids." *The Oil & Gas Journal*, October 16, 1930. Reprint from A. I. M. E. Paper.
[17]Personal communication, May, 1931.

Drill Them Straight

SURVEYS made regularly in all sections of the country to determine how straight wells are being drilled, reveal in many instances a deviation so great that had the surveys not been made, some of the wells undoubtedly would be condemned as dry holes. Possibly this explains some of the instances in the past wherein wells offsetting producing wells have been recorded as failures, and sections of fields condemned for that reason.

We recall that in one of the well known fields in the Mid-Continent a wildcat well was once drilled within 500 feet of the location of what was later the discovery well of a major pool. The original wildcat well was dry. Later production was developed on almost the same spot where the original wildcat well was drilled. In instances of this kind it has been the practice to condemn the crew for passing up a sand or for failure to recognize a sand when they were in it.

As the science of drilling a straight hole develops, as we see developed the science of determining how crooked a hole is and of testing what direction it veers off of the vertical, the value of well logs becomes greater and the necessity of applying the scientific methods and knowledge mentioned above becomes more apparent. These methods of determining whether or not a hole is crooked and in what direction, form a recent contribution to oil production knowledge and this knowledge should be applied more generally than is now the case.

The geological department of an oil company may determine the prospective depth at which a producing horizon should be found if it is there. Of course there is an element of guesswork entering into this but at least the guess is based on a study of all the geological facts available. If the possibility of the loss of a material amount of hole through crooked drilling is to be encountered then the man who is putting up the money —the operator—has additional obstacles thrown in the way of his cashing in on his investment.

In the old days a 3500-foot test was considered a good test in a wildcat venture. We wonder how many 3500-foot holes failed to reach 3500 feet, even though the tape showed 3500 feet—because of crooked drilling. The limit for a reasonable test on wildcat acreage is becoming deeper and deeper each year. With it comes the necessity of watching deviation closely. With it comes the necessity of knowing not only the amount of deviation but the direction as well.

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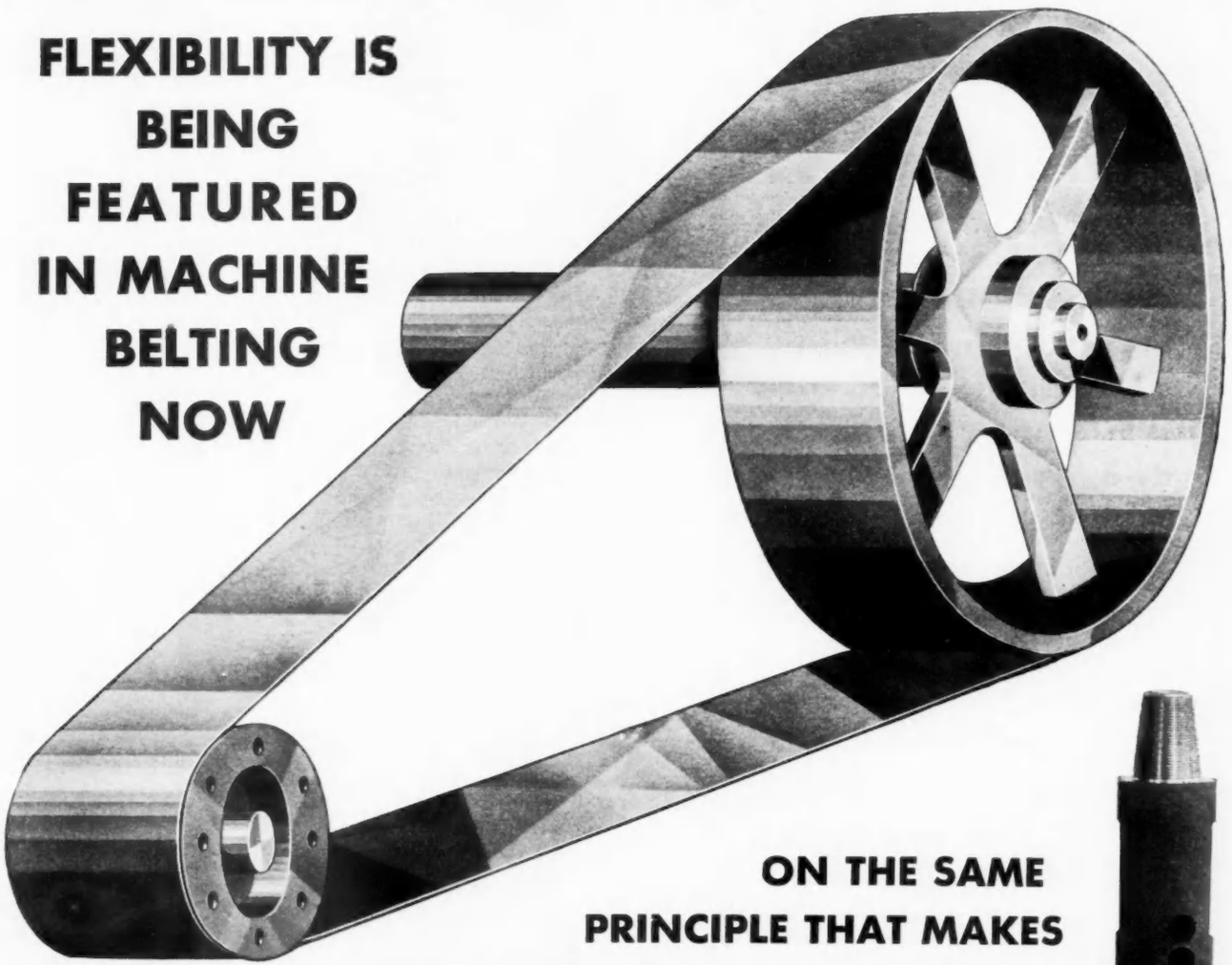

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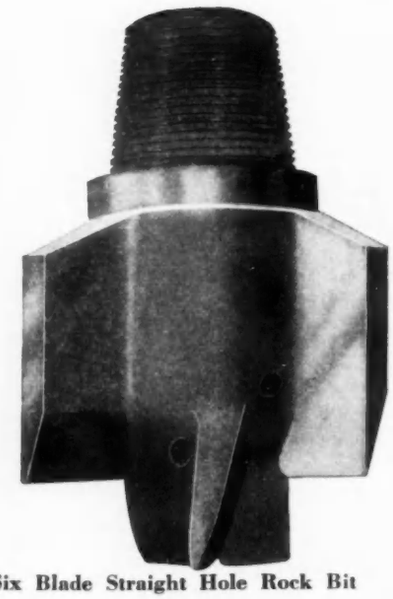
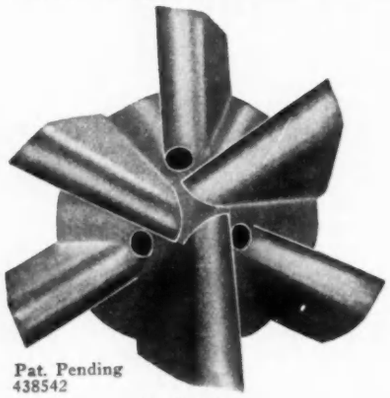


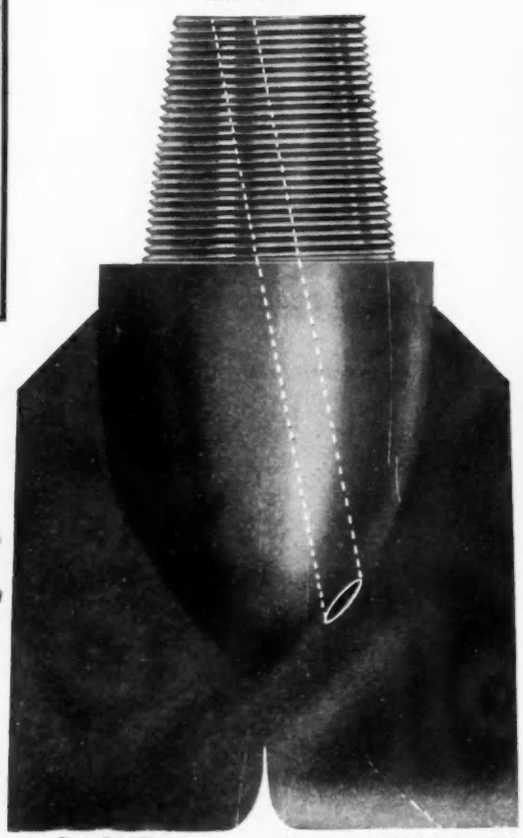
Six Blade Straight Hole Rock Bit



Pat. Pending 438542

End View

Rock Bit Lock



Gumbo Bit

Pat. No. 1,206,488

Fish Tail Bit

Unlocked

Markets • Production • Crude Prices

H. J. STRUTH, *Staff Economist, Houston, Texas*

Crude Situation Continues To Reflect Stability

Crude oil supply and demand were maintained in a state of practical balance last week, production having exceeded market requirements by approximately 3600 barrels. Daily average production increased 4750 barrels to 2,145,600, while indicated market requirements were about 2,142,000 barrels. It has been noted, however, that there has been some confusion regarding the week to week status of pipe line and tank farm stocks of crude in Oklahoma and Kansas. Last week, there was an indicated addition to storage of approximately 1100 barrels a day. In the preceding week, there was a draft on storage in this area of about 35,600 barrels a day. Yet, on the basis of indicated current market requirements, consumption of Mid-Continent crude has slightly exceeded actual production. This is explained by the fact that a number of large refiners have resorted to the sale of stored crude to smaller refiners, thereby reducing refinery crude stocks. It would appear, therefore, that indicated withdrawals from storage shown in the accompanying comparative statement, on page 69, are not far out of line with actual conditions taking place from week to week. From these facts, it seems likely that current demand for Oklahoma and Kansas oil is in excess of production to the extent of about 6000 barrels a day.

California Still Piling Up

California continues to pile up an excessive supply of crude by maintaining daily production 41,000 barrels above market requirements. Last week's production in California was about 50,000 barrels a day more than the allowable figure of 456,000 barrels. As a result of continued excessive production, California operators have accumulated nearly 3,000,000 barrelsofsur surplus supply since the beginning of the year, making a decidedly unfavorable showing in comparison with other areas. At any rate, it is apparent that this excess is wholly responsible for the increase in all storage, since there has undoubtedly been a net reduction in stocks outside of California since January 1. While earlier figures of consumption have indicated a demand somewhat larger than the allowable figure set for California, it is obvious that the local demand has been artificial to some extent, as reflected by persistent increases in stocks of refined products. Then too, the allowable figure contemplated a reduction in stocks. It is seen, therefore, that the industry in California has thus far failed to participate in the general curtailment movement to the extent indicated by the situation elsewhere in the United States. California reported an increase in production last week of 4200 barrels, boosting the state output to 506,300 barrels a day.

East Texas Increase

While crude supply and demand of Texas were in practical balance last week, there was an increase in production of East Texas, amounting to 13,700 barrels a day. Production of the field attained a daily rate of 323,600 barrels, or slightly less than the allowable of 325,000 barrels set by the Texas Railroad Commission. Minor increases in West Texas and Southwest Texas, brought the net increase for the state up to 15,100 barrels a day. Total production of Texas amounted to 840,300 barrels, against an indicated market demand of 840,000 barrels. Production of the Gulf Coast area showed a decline of 3200 barrels a day. Well completions in East Texas last week totaled 97, all producers, having a rated total initial production of 876,300 barrels. Since the area is placed on an allowable of 325,000 barrels on March 16, it is expected that the railroad commission will issue an order placing each well on a limitation of 70 barrels a day. As new wells are brought in, the allowable per well will necessarily have to be reduced accordingly.

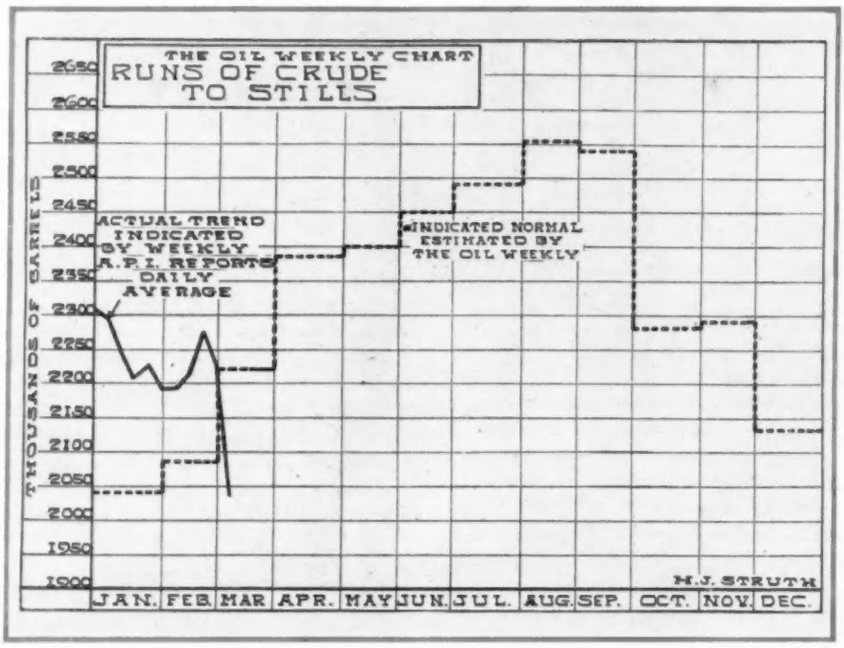
Upturn in Still Runs Increases Gasoline Stocks

Refinery runs were sharply increased last week, resulting in an addition to gasoline stocks of about 232,000 barrels. In contrast with the severe decline in runs reported for the preceding week, there was an increase last week of 108,000 barrels a day, daily average runs having mounted from 2,036,000 barrels to 2,144,000 barrels. As a result, stocks of gasoline increased to a total of 45,661,000 barrels, from 45,429,000 barrels in the preceding week. It is significant, however, that the upturn in gasoline stocks was not commensurate with the rate of increase recorded by still runs, indicating that the demand for gasoline was unusually large for this season, and of perhaps greater proportions than in the preceding week when runs were appreciably lower.

Further evidence of improvement in the gasoline market is apparent from the foregoing figures, which support reports to the effect that depleted jobbers' stocks of gasoline are resulting in renewed buying on a large scale. Increased buying has been particularly noted in the Mid-Continent area, where wholesale prices are beginning to move moderately upward. This furnishes sufficient reason to believe that the approaching season of increased gasoline demand will find the industry in a vastly improved position. How soon the crude market will begin to reflect the industry's improved market outlook depends upon the ability of refiners to maintain still runs at normal rates.

General Firmness Evident in Mid-Continent Refined Market

The greatly improved situation which developed during the past week in Mid-Continent market indicated that jobbers have been caught in a tight spot with tanks almost empty and prices gaining strength. On a resale basis brokers were quoting 3⅜ to 3½ cents on the low octane U. S. motor grades and a low of 3½ cents was being quoted to the trade. Larger refiners were quoting 3¾ on the same grades at the end of the week. Small refiners were quoting 3⅝ to 3¾ cents on the low octane 400 end point grade; 3¾ to 3⅞ cents on low octane 375 end point; and 3⅞ to 4⅛ cents on the 68-70, 360 end point. There



was a possibility that prices on the three latter grades might be increased early in the present week provided higher prices become firmly established throughout the area.

In the 57 to 65 octane range, all grades were being quoted at 3⅞ to four cents and above 65 octane at four to 4¼ cents, the wide range being due to variation in quality. Natural gasolines were much improved with the low at 1½ cents and the possibility of an early increase to 1⅝ cents. Kerosene was firm in price and the demand was good at 2⅝ cents. Colder weather which existed throughout most of the week brought an exceptionally good demand for distillates and low cold test gas oils, in some instances small premiums being paid to guarantee shipment on the same day of placing orders. Prices remained unchanged due to the desire of refiners to liquidate inventories at this season. Zero gas oils were demanding 1¾ cents and straw distillates 1⅞ cents. The low cold test fuels were showing increased strength through better demand, some marketers crediting the increased demand to a slightly improved condition in several lines of smaller manufacturing. Heavier grades and high test fuel oils were unchanged.

Followers of the Mid-Continent market situation have had difficulty in analyzing the crude oil demand which has caused

Crude Runs to Stills, Gasoline Stocks and Gas and Fuel Oil Stocks

For Week Ending March 5, 1932

(Figures in Barrels of 42 gallons each)

District—	Potential Capacity (Daily) Total	Potential Capacity (Daily) Reporting	Per Cent	Crude Runs to Stills Total	Crude Runs to Stills Daily Average	Crude Runs to Stills Per c't Operated	Gasoline Stocks (see note below)	Gas & Fuel Oil Stocks
East Coast	633,700	633,700	100.0	2,956,000	422,300	66.6	6,619,000	6,500,000
Appalachian	149,600	137,400	91.8	611,000	87,300	63.5	1,772,000	1,181,000
Ind., Ill., Ky.	436,300	431,500	98.9	1,803,000	257,600	59.7	5,759,000	4,669,000
Okla., Kans., Mo.	485,700	435,200	89.6	1,349,000	192,700	44.3	3,793,000	3,201,000
Texas	838,200	765,400	91.3	2,902,000	414,600	54.2	8,978,000	9,895,000
Louisiana-Arkansas	233,100	230,500	98.9	1,013,000	144,700	62.8	1,632,000	4,011,000
Rocky Mountain	160,900	143,800	89.4	205,000	29,300	20.4	1,966,000	676,000
California	914,500	888,100	97.1	2,939,000	419,800	47.3	14,910,000	96,042,000
Total March 5	3,852,000	3,665,600	95.2	13,778,000	1,968,300	53.7	45,429,000	126,175,000
Total Feb. 27	3,852,000	3,665,600	95.2	14,999,000	2,142,700	58.5	45,567,000	127,236,000
Total Mar. 7, 1931	3,730,100	3,571,200	95.7	15,205,000	2,172,100	60.8	*45,180,000	127,428,000
Texas and Louisiana Gulf Coastal figures shown below are included in the totals of their respective districts.								
Texas Gulf Coast	532,500	531,500	99.8	2,335,000	333,600	62.8	7,179,000	7,191,000
La. Gulf Coast	147,500	147,500	100.0	693,000	99,000	67.1	1,498,000	3,327,000

NOTE: Stocks at refineries, except in California district, which include stocks of finished gasoline and engine distillate at refineries, water terminals and sales distributing stations and amounts in transit thereto.

*This figure is not entirely comparable with current stocks due to revisions made since original publication of this figure, for which revisions the basic information is not available by weeks. If it were possible to have made the revision, the new figure would reflect somewhat lower stocks.

HOW LAST WEEK'S DAILY AVERAGE PRODUCTION COMPARES WITH ALLOWABLE QUOTAS AND CURRENT DEMAND

State—	Allowable or Economic Limit	Indicated Current Demand	Daily Average Last Week	Added to or Withdrawn from Storage (Estimated)	Daily Average Since Jan. 1	Indicated Excess or Shortage Since Jan. 1
Arkansas	38,000[1]	43,000	34,200	—8,800	33,982	—649,300
California	456,000[2]	465,000	506,300	+41,300	504,308	+2,830,200
Kansas	90,000[1]	100,000	99,750	—250	99,549	+430,250
Louisiana	54,000[1]	63,000	54,800	—8,200	56,474	—469,850
Oklahoma	410,000[3]	425,000	419,300	—5,700	425,205	+474,100
Texas	818,000[1]	840,000	840,300	+300	837,516	—174,350
Balance of U. S.	202,000[1]	206,000	190,850	—15,150	202,733	—175,100
Totals	2,068,000	2,142,000	2,145,600	+3,600	2,159,766	+2,265,950

[1]Economic limit based on data compiled by The Oil Weekly.
[2]Allowable set by California Proration Committee.
[3]Allowable set by Oklahoma Corporation Commission

daily net movement during the past two weeks to run as high as 36,000 barrels from Oklahoma and Kansas storage. One plausible explanation is the fact that large Mid-Continent refiners, operating at a loss, were willing to sell crude to the smaller refiners and buy the refined product of that group at prices below manufacturing costs. This tended to cause a fictitious crude demand and weaken the refined products market. Shut down or sharp curtailment of many of the smaller refineries and a change of policy in this respect on the part of larger refiners probably have played a prominent part in the general improvement which has been observed.

California Demand Not Showing Expected Improvement

California operators differ on the wisdom of reducing production to the net allowable, but agree that the demand for crude has not shown the improvement expected. The fact that

Cracked Gasoline Production

Report for Week Ending March 5, 1932

(Barrels of 42 gallons)

	Potential Charging Capacity			Production	
	Total	Daily Reporting	%	Total	Daily Average
East Coast	261,300	236,300	94.1	613,000	87,600
Appalachian	56,300	54,100	96.1	158,000	22,500
Ind., Ill., Ky.	330,400	315,400	95.5	496,000	70,900
Okla., Kansas., Mo.	237,800	219,500	92.3	287,000	41,000
Texas	450,800	436,200	96.8	656,000	93,700
Louisiana-Arkansas	112,400	112,400	100.0	223,000	31,900
Rocky Mountain	99,900	98,400	98.5	87,000	12,400
California	190,800	190,800	100.0	357,000	51,000
Total March 5	1,739,700	1,663,100	95.6	2,877,000	411,000
Total Feb. 27	1,739,700	1,663,100	95.6	3,088,000	441,100
Total Mar. 7, 1931	1,589,600	1,505,500	94.7	2,698,000	385,400

The Texas and Louisiana Gulf Coastal figures shown below are included above in the totals of their respective districts.

Texas Gulf Coast	352,400	347,400	98.6	531,000	75,900
La. Gulf Coast	77,000	77,000	100.0	161,000	23,000

Imports of Petroleum

AT ATLANTIC COAST PORTS—	Total Month February	Total Month January	Week Ended March 5	Week Ended Feb. 27
Baltimore	942,000	594,000	.....	247,000
Boston	479,000	253,000	58,000	59,000
New York	3,726,000	3,226,000	1,098,000	1,150,000
Philadelphia	837,000	750,000	178,000	162,000
Others	1,002,000	*1,131,000	70,000	*267,000
Total	6,986,000	5,954,000	1,404,000	1,885,000
Daily Average	240,897	192,065	200,571	269,286
AT GULF COAST PORTS—				
Galveston District	59,000	151,000	.....	.....
New Orl's and Baton Rouge	151,000	224,000	193,000	*130,000
Port Arthur and Sabine Dist.	125,000	65,000	193,000	*125,000
Tampa	40,000	46,000	.....	*40,000
Total	375,000	486,000	193,000	295,000
Daily Average	12,930	15,677	27,572	42,143
AT ALL UNITED STATES PORTS—				
Total	7,361,000	6,440,000	1,597,000	2,180,000
Daily Average	253,827	207,742	228,143	311,429
Distribution of Total Imports is as follows:				
Crude	3,791,000	3,099,000	1,093,000	*1,083,000
Gasoline	1,130,000	*1,189,000	.....	480,000
Kerosene	4,000	.....	.....	.....
Gas Oil	154,000	107,000	78,000	76,000
Fuel Oil	2,282,000	*2,045,000	426,000	*541,000
Total	7,361,000	6,440,000	1,597,000	2,180,000

*—Revised.

California Oil Receipts

AT ATLANTIC COAST PORTS—	Total Month February	Total Month January	Week Ended March 5	Week Ended Feb. 27
Baltimore	89,000	120,000	.....	48,000
Boston	.....	53,000	.....	.....
New York	264,000	449,000	.....	33,000
Philadelphia	141,000	117,000	.....	.....
Others	.....	177,000	.....	.....
Total	494,000	916,000	.....	81,000
Daily Average	17,034	29,548	.....	11,571
AT GULF COAST PORTS—				
Total	72,000	.....	.....	.....
Daily Average	2,483	.....	.....	.....
AT ATLANTIC AND GULF COAST PORTS—				
Total	566,000	916,000	.....	81,000
Daily Average	19,517	29,548	.....	11,571
Distribution of Total California Oil Receipts is as follows:				
AT ATLANTIC COAST PORTS—				
Gasoline	494,000	813,000	.....	81,000
Gas Oil	.....	95,000	.....	.....
Lubricants	.....	8,000	.....	.....
Total	494,000	916,000	.....	81,000
AT GULF COAST PORTS—				
Gasoline	72,000	.....	.....	.....

United States Daily Average Production

1931	Oklahoma	Kansas	Texas (Outside Gulf Coast)	Gulf Coast	North Louisiana	Arkansas	Eastern States	Rocky Mountain	California	United States Daily Av.	United States Total
January	452,000	106,350	511,050	188,850	41,100	50,700	110,300	96,700	535,700	2,092,750	64,874,450
February	473,750	114,450	523,700	185,600	43,950	49,950	109,800	100,100	527,300	2,128,600	59,600,450
March	531,900	110,550	585,000	177,950	40,250	47,550	108,800	95,400	528,100	2,225,500	68,990,850
April	543,650	109,250	723,050	185,850	39,050	47,000	111,500	95,500	527,350	3,382,200	71,465,750
May	561,950	107,400	767,200	185,950	39,200	46,650	111,250	97,500	534,150	2,451,250	75,975,950
June	556,850	103,150	828,250	170,100	36,500	44,900	108,950	97,950	520,300	2,466,950	74,009,750
July	527,950	100,000	912,250	157,850	33,650	41,400	107,600	94,400	517,900	2,493,000	77,282,700
August	306,150	101,900	976,800	153,550	30,400	37,650	109,600	92,900	510,900	2,319,050	71,890,200
September	261,050	104,600	752,250	149,950	29,600	38,000	117,400	92,250	505,550	2,050,650	61,518,950
October	423,600	103,950	865,800	153,500	29,200	37,750	121,600	93,950	503,800	2,333,150	72,327,750
November	541,250	104,750	855,550	158,850	29,300	37,650	124,300	93,950	503,050	2,448,650	73,460,150
December	534,650	105,500	795,500	153,550	27,850	35,100	124,500	92,150	503,000	2,371,800	72,525,700
1932											
January	439,250	99,400	735,450	141,050	28,850	34,250	123,050	82,800	505,900	2,190,000	67,890,550
February	412,750	99,300	715,600	140,100	28,400	33,650	118,200	83,600	502,500	2,134,100	61,888,700
March 5	418,600	101,600	714,800	137,500	27,900	34,000	119,600	84,750	502,100	2,140,850	14,985,950
March 12	419,300	99,750	732,550	134,300	28,250	34,200	107,450	83,400	506,300	2,145,600	15,019,200
Increase	700	.....	17,750	.....	350	200	.....	.....	4,200	4,750	33,250
Decrease	.....	1,850	.....	3,200	.....	.....	12,150	1,350	.....	.....	.....

Last Week's Daily Average Production by Districts

TEXAS	For Week Ending Mar. 12	Previous Week
Panhandle	47,700	50,700
North Texas	47,250	47,200
West Central Texas	24,450	23,600
West Texas	182,100	177,550
East Central Texas	55,200	54,850
East Texas	323,600	309,900
Southwest Texas	52,250	51,000
Texas Gulf Coast	107,750	110,400
TOTAL TEXAS	840,300	825,200
OKLAHOMA	419,300	418,600
CALIFORNIA	506,300	502,100
KANSAS	99,750	101,600

LOUISIANA	For Week Ending Mar. 12	Previous Week
North Louisiana	28,250	27,900
Louisiana Gulf Coast	26,550	27,100
TOTAL LOUISIANA	54,800	55,000
Arkansas	34,200	34,000
MOUNTAIN STATES		
Wyoming	37,000	37,450
Montana	6,150	6,200
Colorado	3,400	3,550
New Mexico	36,850	37,550
TOTAL MOUNTAIN STATES	83,400	84,750
*Eastern States	107,450	119,600
TOTAL UNITED STATES	2,145,600	2,140,850

Summarized Review of Field Results

State—	Completions This week	Completions Last week	Oil Wells This week	Oil Wells Last week	Gas Wells This week	Gas Wells Last week	Failures This week	Failures Last week	Initial Prod. This week	Initial Prod. Last week
Arkansas	0	0	0	0	0	0	0	0	0	0
California	3	5	2	3	0	0	1	2	4,560	1,200
Illinois	0	2	0	1	0	0	0	1	0	10
Indiana	1	4	0	1	1	1	0	2	0	50
Kansas	7	14	4	10	1	2	2	2	1,300	4,695
Kentucky	10	4	6	1	2	1	2	2	173	5
Louisiana	4	9	2	2	1	2	1	5	275	1,000
Michigan	1	0	1	0	0	0	0	0	1,400	0
Mississippi	2	0	0	0	1	0	1	0	0	0
New Mexico	2	0	2	0	0	0	0	0	2,240	0
New York	0	0	0	0	0	0	0	0	0	0
Ohio	13	17	4	3	3	10	6	4	252	10
Oklahoma	31	12	9	7	5	4	17	1	727	1,772
Pennsylvania	0	3	0	0	0	1	0	2	0	0
Texas	116	155	107	107	2	9	7	39	878,185	734,614
West Virginia	8	3	3	1	5	1	0	1	20	2
Totals	198	228	140	136	21	31	37	61	889,132	743,358
Increase	..	..	4	..	..	..	..	..	146,774	.....
Decrease	30	..	..	10	..	24	..	.....	.....	.....

Comparison of Permits Granted for New Wells

	For Week Ending Mar. 5	Previous Week	This Week 1931	Total This Month	This Month 1931	Total This Year	Total This Date Last Year	1931 Year Total
Arkansas	0	1	4	1	4	2	16	34
California	10	8	12	18	32	56	79	342
Louisiana	5	9	13	14	27	77	82	309
Kansas	12	13	8	25	16	103	120	475
Oklahoma	18	21	28	39	78	167	251	842
Texas	126	88	101	214	314	1,130	947	6,961
Totals	171	140	166	311	471	1,535	1,495	8,963

oil is now bringing much less than when the state was producing 200,000 barrels more than the present output leads many operators to claim that something is wrong with current quotations. The reason for this seems to lie with failure of the major companies to purchase and store excesses with the same eagerness they displayed a few years ago. These companies are so busy in trying to keep out of embarrassing situations that they do not want to purchase all loose crude to control the refined markets.

Supply and demand is working, just as it has always worked, and it is requiring much less oil to meet requirements than would be required under more normal conditions. A production of only 500,000 barrels seems very low, in the face of an average output of 800,000 barrels daily during 1929. The state is still suffering from this ridiculously high production, but the average operator does not like to trace the present plight back so far.

The low average price received for gasoline on the Pacific Coast is also affecting crude prices. The connection between the raw and refined products is much closer than generally supposed, due to the advent of low price gasoline and the close shopping for cheap charging stock.

Conservative leaders are considering methods of reducing the present output of 500,000 barrels, but nobody can advance a plan of attack. Several fields are over their allowables, and this ragged condition has not strengthened the curtailment plan. Long Beach, Playa del Rey and Santa Fe Springs have long been chronic offenders in this respect.

Higher gasoline prices are expected, but there is no definite reason for an advance of quotations on the top grades of motor fuel. The third grade gasoline sells for 9½ cents in the Los Angeles district, as against 16 cents for the best grade of white gasoline.

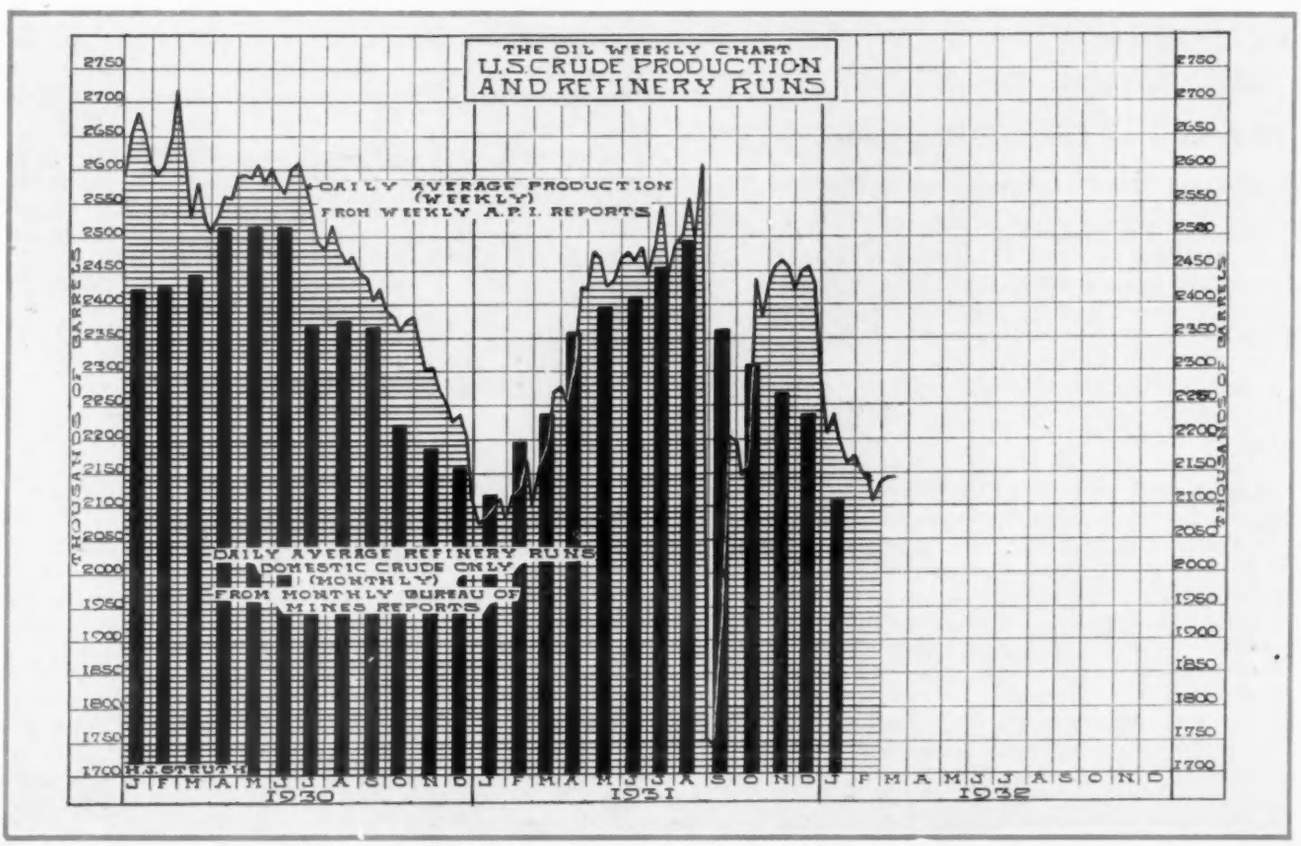
Magnolia Line Runs and Water Shipments Off During February

Dallas, Texas.—Crude runs made by Magnolia Pipe Line Company from Texas, Oklahoma, Louisiana and Arkansas in February aggregated 3,507,406 barrels, or a daily average of 120,945 barrels. This compares with a daily average of 126,020 barrels for January from the same fields. These runs represent crude produced and purchased from other operators by Magnolia Petroleum Company.

Takings from East Texas averaged 47,142 barrels daily in February, as compared to 47,241 barrels daily average the previous month. These runs are greatly in excess of the company's total runs from Oklahoma, where an average of 33,282 barrels daily was maintained during February from all fields. Daily average runs from Oklahoma in January were reported at 36,346 barrels.

Magnolia Petroleum Company added only 9153 barrels of crude to its Oklahoma stocks during February, as compared to 694,383 barrels, or a daily average of 22,399 barrels, in January. The company reported 8,484,103 barrels of oil in storage in Oklahoma at the close of February. The balancing of receipts and deliveries was largely due to Magnolia Petroleum Company having started movement of high gravity crude to the Middlewest refineries of Vacuum Oil Company.

Tanker shipments of crude oil from the Beaumont terminals of Magnolia Petroleum Company involved nine separate cargoes, aggregating 531,626 barrels, or 83,340 barrels less than the total water movement of crude made the previous month.


THE OIL WEEKLY CHART
U.S. CRUDE PRODUCTION AND REFINERY RUNS
DAILY AVERAGE PRODUCTION (WEEKLY) FROM WEEKLY A.P.I. REPORTS
DAILY AVERAGE REFINERY RUNS DOMESTIC CRUDE ONLY (MONTHLY) FROM MONTHLY BUREAU OF MINES REPORTS
THOUSANDS OF BARRELS
1930
1931
1932

Texas Proration Hearing Set for March 30, at Austin

Austin, Texas.—The railroad commission has set March 30 for a hearing to take evidence out of which proration orders for the oil fields of Texas will be set. The only exceptions are East Texas, which is under combination control of martial law and the railroad commission, and the Panhandle area, which is under control of the commission.

Producers of the Van field have petitioned for a hearing, which will be part of the March 30 action. This is the only field, where an increase is being asked. This field is now restricted to 50,000 barrels a day and producers are asking for an additional 25,000 barrels. It is understood, however, that this additional output will not be seriously pressed at this time.

Moore County Petition Under Advisement

Austin, Texas.—After hearing evidence Monday the Texas Railroad Commission has taken under advisement the petition of the Shamrock Oil & Gas Company for a separation of Moore County from the remainder of the Panhandle from a conservation standpoint. The petition was opposed by Don Emory of Phillips Petroleum Company and A. C. Smith of The Texas Company, whose position was that there was no justification for this separation.

Shamrock Oil & Gas Company has three producing wells and two drilling in Moore County. The position was taken that there is a geologic "high" running from Wheeler into Sherman County and this separates Moore County from other Panhandle pools. They contended further that the area is a new pool and should be so considered until it has reached daily output of 10,000 barrels. The company recently purchased a refining plant at Sunray as well as a pipe line from the pool to the plant. The oil is wanted for operation of this plant.

Directors of Cranfill-Reynolds Approve Sale of East Texas Holdings

Houston, Texas.—Directors of Cranfill-Reynolds Company on March 9 voted final approval of the sale of some of the concern's properties in East Texas to Atlantic Oil Producing Company, with the result that the latter immediately made the large cash payment necessary for consummation of the deal.

Cranfill-Reynolds Company sold approximately 1400 acres of proven leases and 13 producing wells to the Atlantic interests for $3,000,000 in cash, including a large immediate payment and the remainder in deferred cash notes.

The properties are in the East Texas field proper, being for the most part in Gregg County, immediately south of the Sabine River, although several small leases farther south in Rusk County are also included. These oil lands are adjacent to leases which the Atlantic interests acquired last summer from Cranfill-Reynolds Company.

While it has disposed of the above properties, Cranfill-Reynolds Company still retains substantial holdings in the East Texas field, including about 400 acres of proven or semi-proven leases and 10 producing wells, an extensive pipe line gathering system, and a tank farm consisting of five 55,000-barrel steel tanks and two smaller tanks.

Leases which have been retained include the following: McGrede 16-acres, Rembert 88 acres, Rembert 8 acres in fee, Barnswell 50 acres, George Anderson 8 acres, Susan Scott 42 acres, Blackman 36 acres, Clayborn 50 acres, R. L. Martin 40 acres, and Bowie and Marshall 53 acres.

Cranfill-Reynolds Company also retains all its interest in the promising lease block near Jamestown, Upshur County, north of the big East Texas field proper, on which the wildcat producer, Rash 1, was completed.

Aside from its East Texas properties, the company also has valuable oil lands and producing wells in the coastal, central west, southwest, and western sections of Texas, and in New Mexico.

Fort Worth, Texas.—Directors of the Texas Oil & Gas Conservation Association pledged the support of their organization in aiding state authorities in uncovering and prosecuting gasoline tax evaders and operators who are guilty of defrauding royalty owners at a meeting here March 10. Chas. F. Roeser, president Roeser-Pendleton, Inc., and head of the organization, presided at the meeting, which was attended by approximately 50 directors.

Membership in the Texas Oil & Gas Conservation Association is now greater than any oil body in the state. E. H. Eddleman, executive vice-president, informed the directors that more than 4600 persons have joined since the organization was formed last year.

Recent discovery of secret pipe line connections on supposedly prorated wells in the East Texas field, resulting in the violation of proration rules and defrauding of royalty owners, were discussed by the directors. A resolution was passed condemning such practices, and the association has tendered its aid to state authorities in helping to prevent a repetition in this or other fields. A second resolution deplored the growing tendency on the part of some refiners and jobbers to evade the state tax of four cents per gallon on gasoline, and the directors pledged the support of their organization in helping authorities stamp out the evil.

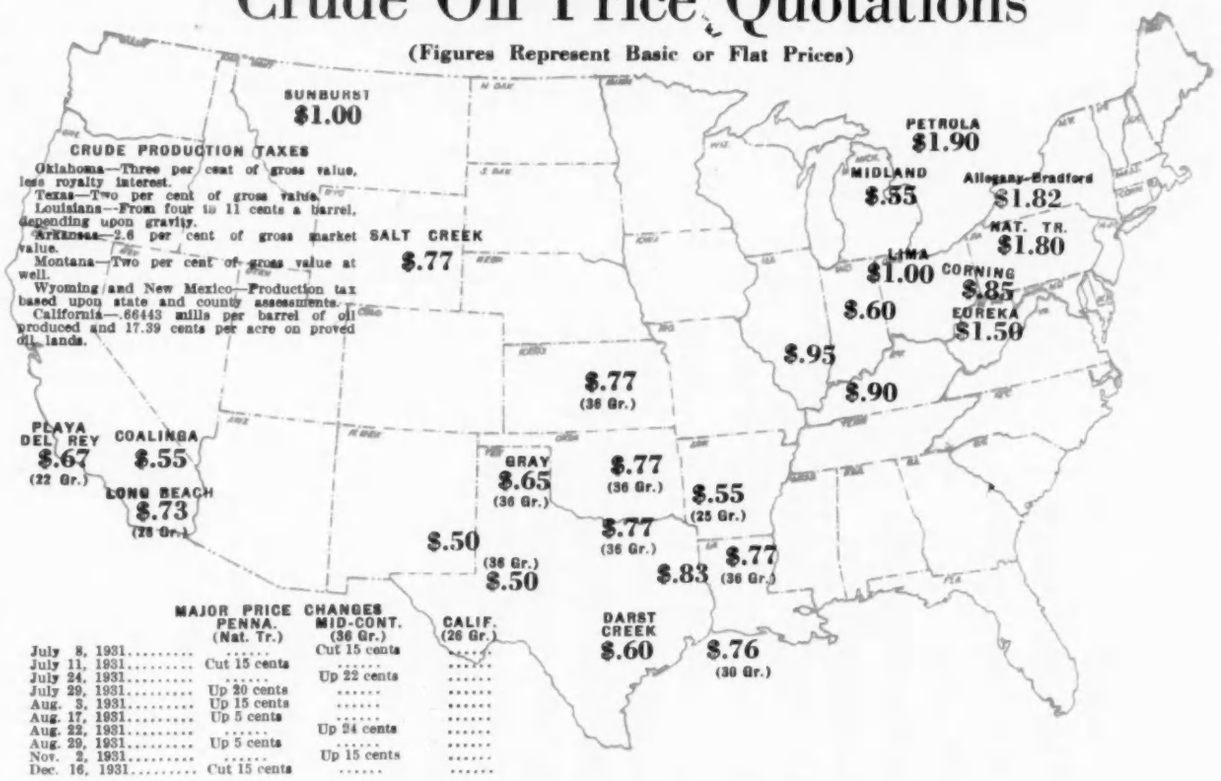
The report of a committee appointed several months ago to draft a set of by-laws was accepted by the directors, who also gave their approval of the six-point program to be followed by the organization in its campaign to protect the natural gas and oil resources of the state.

Fleming Is Re-elected to Head Marathon Oil Company

Tulsa, Oklahoma.—The annual meeting of Marathon Oil Company, a subsidiary of the Ohio Oil Company, was held in Tulsa, March 7. Walter W. Fleming was re-elected president with Lewis B. McCammon, H. J. Scott, and A. M. Gee as new vice-presidents. McCammon will be in charge of sales and manufacturing, Scott will be general sales manager, and A. J. Slagter will hold the position of general superintendent of refineries. Gee is general counsel for both Mid-Kansas Oil & Gas Company and Marathon Oil Company. J. L. Cook is secretary-treasurer. R. J. Berry, vice-president of the Ohio Oil Company and president of Mid-Kansas Oil & Gas Company is chairman of the board of directors of Marathon. Myron H. Wagner, general superintendent of production for Mid-Kansas Oil & Gas Company, was added to the board of directors of the Marathon.

Crude Oil Price Quotations

(Figures Represent Basic or Flat Prices)



MAJOR PRICE CHANGES

	PENNA. (Nat. Tr.)	MID-CONT. (36 Gr.)	CALIF. (26 Gr.)
July 8, 1931	.....	Cut 15 cents	.....
July 11, 1931	Cut 15 cents	.....	.....
July 24, 1931	.....	Up 22 cents	.....
July 29, 1931	Up 20 cents	.....	.....
Aug. 3, 1931	Up 15 cents	.....	.....
Aug. 17, 1931	Up 5 cents	.....	.....
Aug. 22, 1931	.....	Up 24 cents	.....
Aug. 29, 1931	Up 5 cents	.....	.....
Nov. 2, 1931	.....	Up 15 cents	.....
Dec. 16, 1931	Cut 15 cents	.....	.....

Official Postings and Differentials

(Revised to March 15, 1932)

California: (Effective June 19, 1931.)

Signal Hill, Seal Beach and Alamitos Heights: 14 to 22.9 gravity 65 cents; 23 gravity 67 cents with differential to two cents for each degree upward. Top price for Signal Hill, 30 gravity, 81 cents; top price Seal Beach and Alamitos Heights, 27 gravity, 75 cents.

Huntington Beach: 14 to 21 gravity, 65 cents; 22 gravity, 66 cents with differential of two cents for each degree upward. Top price, 27 gravity, 76 cents.

Inglewood: 14 to 19.9 gravity 65 cents; 20 gravity 66 cents with differential of two cents for each degree upward. Top price, 25 gravity 76 cents.

Playa Del Rey: 19 to 20.9 gravity 65 cents with differential of one cent for each degree upward. Top price, 25 gravity, 70 cents.

Olinda and Brea Canyon: 14 to 19.9 gravity 65 cents; 20 gravity 66 cents; 21 gravity 67 cents; 22 gravity 68 cents with differential of two cents for each degree upward. Top price, 28 gravity, 80 cents.

Coyote Hills: 14 to 22.9 gravity 65 cents; 20 gravity 66 cents; 21 gravity 67 cents with differential of two cents for each degree upward. Top price, 28 gravity, 79 cents.

Santa Fe Springs: 24 to 26.9 gravity 65 cents; 27 gravity 68 cents; 28 gravity 71 cents; 29 gravity 73 cents; 30 gravity 75 cents; 31 gravity 78 cents; 32 gravity 80 cents; 33 gravity 83 cents; 34 gravity 85 cents; 35 gravity and above 87 cents.

Whittier, La Habra and Montebello: 65 cents a barrel.

Torrance: 14 to 21.9 gravity 65 cents with differential of one cent for each degree to 25 gravity and two-cent differential for 25 gravity. Top price, 25 gravity, 70 cents.

Richfield: 14 to 20.9 gravity 65 cents; 21 gravity 66 cents with differential of two cents for each degree upward. Top price, 25 gravity, 74 cents.

Elwood: 33 gravity 79 cents; 34 gravity 81 cents with differential of three cents for each degree upward. Top price, 36 gravity, 87 cents.

Newhall, McKittrick and Kern River: 55 cents a barrel.

Midway-Sunset, Elk Hills and Buena Vista Hills: 14 to 21.9 gravity 55 cents; 22 gravity 56 cents; 23 gravity 58 cents; 24 gravity 61 cents; 25 gravity 64 cents; 26 gravity 66 cents; 27 gravity 68 cents; 28 gravity 71 cents; 29 gravity 74 cents; 30 gravity 76 cents.

Lost Hills: 14 to 20.9 gravity 55 cents; 21 gravity 57 cents; 22 gravity 59 cents; 23 gravity 60 cents; 24 gravity 62 cents; 25 gravity 64 cents; 26 gravity 66 cents; 27 gravity 67 cents; 28 gravity 69 cents; 29 gravity 71 cents; 30 gravity 72 cents.

Coalinga: 14 to 24.9 gravity 55 cents; 25 gravity 57 cents.

Wheeler Ridge: 55 cents a barrel.

Athens, Dominguez and Rosecrans: 24 to 24.9 gravity 69 cents with differential of two cents for each degree upward. Top price, 34 gravity, 89 cents a barrel.

Oklahoma, Kansas, North Texas (Effective January 8, 1932).

Below 29 gravity; 61 cents, with differential of 2 cents for each degree to 40 gravity and above which is posted at 85 cents.

Texas Panhandle: (Effective November 2, 1931)

Gray County: Below 35 gravity: 61 cents, with differential of 2 cents for each degree to 40 gravity and above which is posted at 73 cents.

Carson and Hutchinson Counties: Below 35 gravity; 56 cents with differential of 2 cents for each degree to 40 gravity and above which is posted at 68 cents.

West Texas: (Effective November 2, 1931).

Crane-Upton, Crockett, Ector, Howard-Glasscock, Pecos and Winkler Counties, Texas and Lea County, New Mexico: 50 cents a barrel.

Southwest Texas: (Effective November 2, 1931)

Refugio: Heavy: 75 cents.

Refugio: Light: (Same as Gulf Coast—see below).

Gulf Coast: (Effective November 2, 1931)

Goose Creek, Hull, Liberty, Orange, Pierce Junction, Mykawa, Moss Bluff, Raccoon Bend, Barbers Hill, Sour Lake, Spindletop, Sugarland, West Columbia, Humble and Refugio Light: Below 25 gravity: 70 cents, with differential of 1 cent for each degree to 40 and above which is posted at 86 cents.

Mirando: 75 cents; **Salt Flat:** 60 cents; **Darst Creek:** 60 cents; **Pettus:** 85 cents; **Markham:** 67 cents.

East Texas (Effective November 2, 1931)

Flat Price 83 cents.

North Louisiana and Arkansas: (Effective Nov. 4, 1931)

Caddo, Homer, Haynesville, Bull Bayou, Sabine, Cricton, DeSoto, El Dorado, Cotton Valley, Sarepta, Cartersville: Below 25 gravity 53 cents with differential of 2 cents for each degree beginning with 25 gravity and ending with 40 and above. Top price 85 cents a barrel.

Smackover: 55 cents.

Rocky Mountain States: (Effective Nov. 3, 1931)

Salt Creek: Below 29 gravity 61 cents; 29-29.9 gravity 63 cents, with differential of 2 cents each degree to 40 and above. Top price 85 cents.

Elk Basin and Grass Creek: $1.05; **Big Muddy:** 83 cents; **Lance Lance Creek** $1.05; **Rock Creek:** 85 cents; **Sunburst:** $1.00; **Osage:** 98 cents; **Cat Creek:** $1.05 cents; **Pondera:** 90 cents; **Hogback, New Mexico:** 80 cents.

Eastern States: (Effective November 3, 1931)

Lima: $1.00; **Indiana:** 60 cents; **Illinois:** 95 cents; **Princeton** 95 cents; **Wooster:** $1.15; **Western Kentucky:** 90 cents.

Pennsylvania: (Effective March 12, 1932)

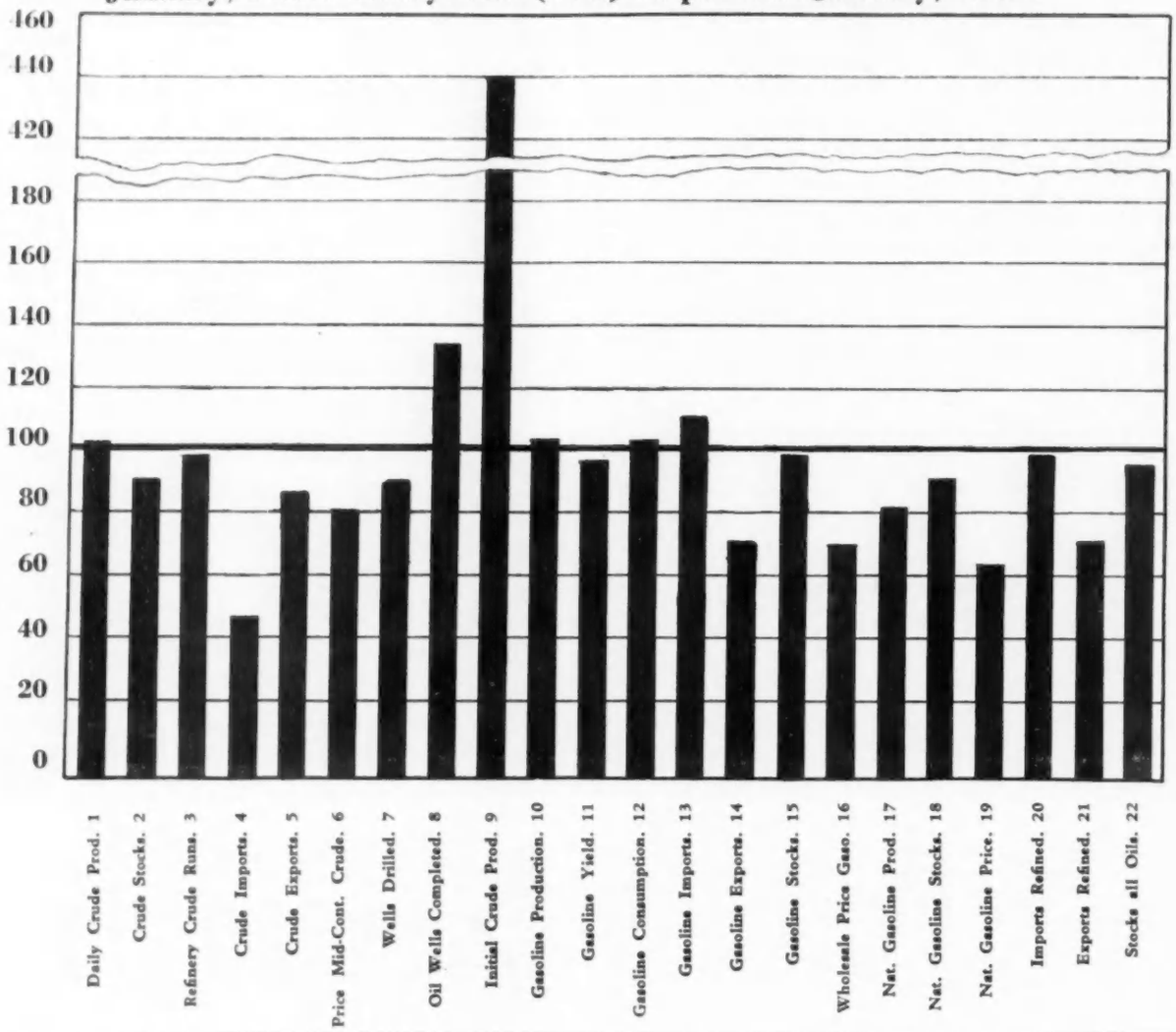
Bradford District: $1.82; National Transit Oil: $1.80; Southwest Pennsylvania Pipe Line Oil: $1.55; Eureka Pipe line Oil: $1.50; Buckeye Pipe Line Oil: $1.35; Corning Crude: 80 cents.

Michigan: (Effective Oct. 9, 1931). **Midland:** 55 cents a barrel. **Muskegon:** Same posting as Mid-Continent; 61 cents to 85 cents a barrel.

Canada: (Effective Nov. 3, 1931).

Petrolia: $1.90; **Oil Springs:** $1.97.

Salient Oil Industry Factors for January, 1932, Expressed in Per Cent of January, 1931. Heavy Line (100) Represents January, 1931



Oil Industry Barometer—January, 1932

Index of Salient Factors

	Factors—	This Month Last Year	This Month This Year	Index (1)
1	Daily Average Crude Production (Thous. Bbls.)	2,120	2,158	102
2	Total Crude Stocks (Thous. Bbls.)	409,142	369,382	90
3	Refinery Crude Runs (Thous. Bbls.)	70,207	68,715	98
4	Crude Imports (Thous. Bbls.)	4,353	2,047	47
5	Crude Exports (Thous. Bbls.)	1,919	1,633	85
6	Posted Price 36 Gravity Mid-Cont. Crude (Per Bbl.)[2]	$.95	$.77	81
7	Wells Drilled	1,156	1,031	89
8	Oil Wells Completed	519	693	133
9	Initial Crude Production (Thous. Bbls.)	797	3,505	440
10	Gasoline Production (Thous. Bbls.)	32,708	33,535	103
11	Gasoline Yield—Average Per Cent of Crude[4]	43.6	44.5	102
12	Domestic Gasoline Consumption (Thous. Bbls.)	26,415	26,845	102
13	Gasoline Imports (Thous. Bbls.)	1,116	1,224	110
14	Gasoline Exports (Thous. Bbls.)	4,903	3,422	70
15	Gasoline Stocks at Refineries (Thous. Bbls.)	42,981	42,604	99
16	Refinery Price U. S. Motor Gaso.—Group 3 (Cents)[3]	4¼	3	70
17	Natural Gasoline Production (Thous. Bbls.)	4,140	3,342	81
18	Natural Gasoline Stocks (Thous. Bbls.)	3,252	2,934	90
19	Price Grade "A" Natural Gasoline, Group 3 (Cents)	3½	2¼	64
20	Imports of All Refined Oils (Thous. Bbls.)	3,601	3,550	98
21	Exports of All Refined Oils (Thous. Bbls.)	10,091	6,989	69
22	Total Stocks of All Oils (Thous. Bbls.)	662,132	632,030	95
	Weighted Index of Supply	....	....	91
	Weighted Index of Demand	....	....	85
	Weighted Index of Prices	....	....	71

[1]Last Year—100. [2]Weighted Average. [3]Monthly Average.
[4]Straight run and cracked gasoline only.

Further Statistical Improvement Strengthens Price Structure

By H. J. STRUTH
Staff Economist

HIGHER oil prices are perhaps closer to realization than many believe. Continued improvement in the industry's statistical position, combined with more evidence that East Texas will not be permitted to get out of bounds, has materially strengthened the industry's price structure. Gradual clearing of the horizon in recent weeks, as a result of constructive developments in both the producing and refining branches, has instilled a new note of confidence in practically all sections east of California. Reduction in still runs and withdrawals of gasoline from storage has already injected new life into the gasoline market. As a result, prices are showing a firmer tone and creating a larger volume of business from jobbers. Renewed buying from this source, brought about by necessity because of depleted working stocks, has practically eliminated "distress" gasoline from the market and refiners in practically all sections are now gradually "feeling their way" into a justifiably higher price zone.

Inequalities that have existed between the price of crude and the price of gasoline are expected to be adjusted soon. The move to curtail the output of gasoline has undoubtedly been timed just right, as increased buying for spring demand will find a more united front among refiners on deservedly higher values. Of further significance in this direction is the rate of decline recorded in the production of cracked gasoline during January. The accompanying barometer shows that the average yield of gasoline from crude oil dropped to 44.5 per cent, as compared with 45.2 in December and 46 per cent in November. Obviously, the tendency to curtail cracking operations at this time will have a two-fold effect upon the gasoline supply in conjunction with recent reductions recorded in still runs. Since working stocks of gasoline at refineries are only about 5,000,000 barrels in excess of normal, it is apparent that the present drastic curtailment movement is bound to result in rapid stabilization of supply.

Gasoline Demand Improves

Despite the earlier pessimistic outlook, gasoline demand has shown unlooked-for improvement. Domestic gasoline consumption in January was about two per cent above the same month of last year, although the export market slumped 30 per cent under last year's total. Gasoline stocks at refineries are only slightly above the quantity held a year ago, while stocks of all oils are about 30,000,000 barrels less than they were at this time last year. Despite the fact that still runs were reduced in January, stocks of gasoline showed an increase of about 4,500,000 barrels over those of December. This was due to a sharp decline in domestic consumption under the December rate, having receded to a total of 26,845,000 barrels from 30,529,000 barrels in December. Exports showed an increase over December of 731,000 barrels, while imports increased 431,000 barrels.

While the recorded rate of new oil production is shown to be abnormally high in comparison with the same month of last year, it is no longer recognized as a depressing market factor. In fact, there is no sound reason to regard potential supply as a market factor, as everything points to a definite tightening of legal measures of control. The industry has undoubtedly reached a new understanding of economic laws and has apparently awakened to the realization that its troubles have come almost entirely from within, and that they must be corrected from within. Recent developments prove that sound progress is being made in this direction. By the removal of the uncertainty that has attended developments in East Texas, it will be noted that there is beginning to be a more definite tendency toward equalization of supply and demand. By using actual supply and demand factors, and disregarding the former influence of potential, the industry's statistical position has settled upon a more secure foundation.

Curtailment in February

A projection of the more important supply and demand figures into February, based upon available weekly reports, shows that crude oil production was further curtailed under January by an average of about 56,000 barrels a day, while refinery runs were reduced but 3000 barrels a day. However, recent reports show that refiners have reduced runs under the indicated February rate by about 178,000 barrels a day. Imports of all oil were somewhat higher in February; about 7,142,000 barrels, against 5,597,000 barrels in January. Indicated gasoline consumption, for domestic and foreign account probably amounted to 27,930,000 barrels, against 30,267,000 barrels in January. Well completions were still lower in February; 884, against 1031 in January, while potential gauges accounted or a total of 3,050,000 barrels, against 3,505,000 barrels in January. Prices were practically unchanged from those of January, appearing in the accompanying barometer.

The turn for the better, as shown by the accompanying figures and as evidenced by subsequent constructive developments, leaves little room for pessimism. Better times are undoubtedly just ahead, but they will only be realized if everyone puts his shoulder to the wheel and carries the curtailment job through to completion. If refiners continue their indicated efforts to balance the supply and demand of gasoline by maintaining runs at sane levels, the price of gasoline and all other products is bound to rise. When gasoline prices begin to show a definite upward trend, the producer will be in a position to benefit from curtailment. Controlled production and refinery runs will soon be rewarded by better prices; the only way to sustain a better market structure is to continue to balance supply with current demand.

Los Angeles.—Standard Oil Company of California will soon complete an eight-inch welded pipe line between Kettleman Hills and Estero Bay, a distance of about 70 miles, and paralleling a 10-inch line completed some time ago. The line now under construction was started last October and is being laid to furnish employment to a large number of men who would otherwise be idle. The project will cost about $500,000 and will be used for handling various Kettleman Hills products.

Commission Order Borger Gas Rate Reduced

Austin, Texas.—Announcement by the railroad commission that it has allowed a reduction of 25 per cent in gas rates at Borger is expected to loose a flood of applications from towns in every section of Texas. The Borger city council passed an ordinance reducing the rate last June. This was suspended until the decision of the commission was reached. The ruling, however, is retroactive, which will require the Panhandle Power & Light Company to make rebates to all consumers on bills paid since the ordinance was passed. The rate was cut from 50 to 40 cents for the first thousand cubic feet. Several other applications are pending.

Cranfill-Reynolds Stockholders Change Personnel of Directorate

Houston, Texas.—A meeting of stockholders of Cranfill-Reynolds Company here March 9 resulted in two changes of personnel in the board of directors of the company, and the new directorate in a meeting held immediately afterward effected one change in the list of officers.

The new directors are Shearn Moody of Galveston and Mabry Seay of Dallas, who replace W. L. Moody, III, of Galveston and O. R. Seagraves of Houston. The directorate is made up of nine members. The seven former directors who were reelected included George S. Heyer, J. H. Reynolds, Palmer Bradley, and W. L. Goldston, all of Houston Tom E. Cranfill, Dallas; A. H. Richardson, San Antonio; and J. Edgar Pew, Philadelphia. Following a policy which had been pursued by the former directorate, the new board functioned at its initial meeting without a chairman.

George S. Heyer was reelected president of the company, and the only change made in the list of officers was the selection of Shearn Moody, one of the two new directors, as vice-president and treasurer. J. H. Reynolds, who is in charge of drilling and production, formerly filled the vice-president's position. Frank Trevitt of Houston was chosen again as secretary, and he will serve also as assistant treasurer; and Joe Dean and Bryant Seay are assistant secretries.

Report Shows 82 Per Cent Gas Produced Used in California

Los Angeles.—Claude C. Brown, gas engineer for the California Railroad Commission, has issued a report which shows that 82.2 per cent of all natural gas produced in California during 1931 was utilized. The following table shows production and distribution in the state during last year:

	M. C. F.	Per Cent Output
1. Production—		
Total Net Production	385,201,300	100.0
2. Utilization—		
Repressuring and Storage	10,396,900	2.7
Gasoline Plant Fuel and Shrinkage	69,250,300	18.0
Field Fuel	55,467,200	14.3
Other Fuel (Refineries, etc.)	12,643,800	3.3
Sales to Gas Utilities, Others	168,964,800	43.9
	316,723,000	82.2
3. Waste—		
Total Blown to the Air	68,478,300	17.8

Well Sold to Junk Dealer, Then To Independents, Is Flowing Oil

Blackwell, Oklahoma.—The story of an oil well which reads something like those of Horatio Alger came through on the report of last week when Harris and Haun's Cole 1, CNE SE Section 18-29n-1e, in the old Mervine pool, was making 100 barrels of oil from siliceous lime at 3320 to 3355 feet.

The well was originally completed by Tidal Oil Company as a 90,000,000 cubic foot gasser in Wilcox sand at 3224 to 3241 feet. After water had killed the flow and it was no longer commercial, Tidal Oil Company sold the well to a junk dealer, who in turn sold it to Harris and Haun for an increase of about 50 per cent over what he had paid for it on a junking basis.

When first drilled into the lime at a total depth of 3346 feet Cole 1 responded with an initial flow of 60 barrels an hour. Three days later the flow had decreased to 53 barrels of oil and 23 barrels of water daily with the water increasing. Today it is making about 100 barrels daily through tubing.

Wrightsman Is Elected to Head Standard Oil Company of Kansas

Tulsa, Oklahoma.—C. B. Wrightsman of Wichita, Kansas, was elected president of the Standard Oil Company of Kansas, succeeding A. S. Hopkins, at a meeting of the newly elected board, held in Neodesha on March 10. Wrightsman headed a committee of stockholders who recently objected to business policies of the former administration and was instrumental in bringing about re-organization of the new board which is composed of Wrightsman, Lionel T. Barneson, A. H. Bunker, A. S. Hopkins and E. A. Warren. Other officers elected at the meeting of March 10 were as follows: A. S. Hopkins, vice-president; E. A. Warren, vice-president; H. G. Lea, secretary-treasurer.

Flood to Supervise Repressuring For Ohio in Mid-Western Field

Shreveport, La.—Millard Flood, consulting engineer, who has been in charge of the repressuring project in the Haynesville, Louisiana, oil field since its inception two years ago, is making a composite report of the accomplishments of the project, preparatory to going to Marshalltown, Illinois, where he will be assigned to a mid-western field to install a repressuring project.

Mr. Flood is employed by Ohio Oil Company, which was one of three companies participating in the Haynesville repressuring project, and he will continue with the Ohio Oil Company in the mid-western repressuring project.

The daily average in the Haynesville field has been built up to approximately 5000 barrels from approximately 3800 barrels daily. Further expansion of the repressuring had been planned but the program's expansion was halted last summer when the price of crude oil dropped to the low level, 22 cents for 40 gravity and above in North Louisiana, where an 11-cent severance tax based on a gravity basis for 40 gravity and above, is in force.

Reserve Petroleum Company and Louisiana Oil Refining Corporation were the other two companies participating in the repressuring work at Haynesville, which will be continued, pursuant to recommendations now being prepared by Mr. Flood.

Personal Mention—Men You Know

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JUDGE W. O. CRAIN of Houston, connected with the legal department of The Texas Company for nearly 22 years, has been appointed general attorney at Houston, succeeding the late Thomas J. Lawhon, who died in February. Judge Crain was born in Nacogdoches, Texas, where he received his elementary education and later entered the employ of the law firm of Branch, Garrison and Blount to study law. This was followed by a period in which he received further law training as a court reporter. When the judge was 21 years old he was admitted to the bar, following which he took a special law course in the University of Texas. Then he returned to the Nacogdoches firm as an active attorney. After engaging in private practice for a while, Judge Crain became city attorney of Nacogdoches until 1907, when he became legal examiner of the state general land office at Austin. May 1, 1910, he accepted a connection with the legal department of The Texas Company, serving in this connection for six or seven years before he was made assistant general attorney under Judge Lawhon.

AMOS L. BEATY, president of the American Petroleum Institute was the principal speaker at the annual banquet of the California Oil & Gas Association which was held at the Biltmore Hotel, Los Angeles, Thursday night, March 10. He placed the blame for many of the ills of the industry on the industry itself and asked for the inauguration of practices which will lead to a sensible and profitable basis for all. A. L. Weil, prominent attorney, explained the advantages of the Sharkey bill, a measure which was drawn to regulate oil production in the state and which will be voted on in May. The attendance totaled about 800.

EDGAR C. JOHNSTON, president of Johnston Formation Testing Corporation, returned to headquarters at Longview, Texas, last week after having journeyed to Calgary, Canada, to supervise the running of a formation tester on a 5400-foot hole drilled by Commonwealth Petroleum Company.

MERRILL W. BLAIR, Wichita Falls, independent producer, has been elected president of the North Texas Oil & Gas Association. Blair is president of United Producers Company, and is a leader in conservation activities in the district. T. O. Shappell, president Shappell Oil Company, and R. A. King, president King Royalty Company, were elected vice-presidents. Fred Sehmann, who has been secretary-treasurer since the organization was formed in January, 1930, was re-elected.

E. E. HENDERSON, well known California operator, died recently at his home in Los Angeles. He drilled the discovery well in the Cat Canyon field and was active in several other fields.

H. K. V. TOMPKINS, who has a long record of service with Gulf Oil Company, has resigned to become personal assistant to J. Paul Getty, president of George F. Getty, Inc., a large California operator. He was in charge of operations for Mexican Gulf Oil Company during the height of development in Mexico, and was more recently an executive of the Gulf Production Company in the Houston office.

ENRIQUE COSTABAL, consulting engineer for Santiago, Chile, spent a portion of the past week in the Mid-Continent area as a part of his program of study of the American petroleum industry. Senor Costabal left Chile in September, 1931, coming to this country as a delegate to the Fourth Pan-American Convention. After the convention he commenced a tour of oil fields and refineries, covering the eastern part of the United States first, and swinging westward through the Mid-Continent and Gulf Coast areas. He sails March 26, for Santiago and will resume consulting practice, in addition to acting in an advisory capacity to the Chilean government on oil affairs. Although Chile has no oil production other than that which is obtained from seepages, Senor Costabal says that a well now being drilled in the southermost portion of the country, has encountered a showing of undetermined value at a depth of approximately 1200 meters or 3937 feet.

E. COSTABAL

A. H. BELL, district chairman of the Pacific Coast Section of the Division of Production of the American Petroleum Institute, will preside at the spring meeting to be held in Los Angeles, March 28.

JOHN B. ELLIOTT, vice-president of Jamieson Petroleum Corporation and vice-president of the Independent Petroleum Association of California, has been elected chairman of the John N. Garner-for-President Committee of Southern California.

R. J. DAUGHERTY of Bartlesville, Oklahoma, director of public relations of the Empire Companies, has been elected president of the Oklahoma Utilities Association.

WILLIAM G. JENSEN of Jensen Brothers Manufacturing Company of Coffeyville, Kansas, manufacturers of pumping equipment, is on a tour of the Texas fields.

E. C. JOHNSTON recently made a trip to Calgary, Canada, for Johnston Formation Testing Corporation, Longview, Texas, to make an open-hole test on a 5400-foot Commonwealth Petroleum Company well. The hole at this depth was 3⅞-inch, and the test showed salt water.

L. M. OLES, division geologist for Prairie Oil & Gas Company in the Amarillo district, was a visitor in the company's offices in Tulsa during the past week.

Sulphur Water in Ector County Wildcat Does Not Condemn Area

SAN ANGELO, Texas.—Elimination of the Ector County wildcat test of Weekly Oil Corporation, Casteel and McCurdy, on the E. F. Cowden ranch, located about eight miles west of Odessa, from oil possibilities as result of drillings being halted at 4375 feet with a hole full sulphur water has not condemned the area. This wildcat is to be plugged back to try for a gasser by shooting the lime horizon that showed gas at 3785-3798 feet, and in the meantime sufficient encouragement in the form of oil and gas showings has been gained to assure the financing of another test at a higher point on the structure.

Deepening of Sid Richardson et al's semi-wildcat test on the S. M. Halley ranch, Winkler County, to 2968 feet late last week failed to materially increase the column of oil rising in the hole. This test is on a line between the Hendrick field and the O'Brien Ranch pool. First production appeared at 2810 feet, with an increase in oil at 2870-76 feet. The hole was swabbed dry late last week, and after standing six hours filled 150 feet with oil, which was swabbed from the hole, then it filled 100 feet in three hours. It has a surface elevation of 2712 feet. Several offsets will be drilled in the event a commercial producer is scored.

Progress on Stanolind Oil & Gas Company's deep wildcat test on the W. H. Williams ranch, Irion County, was temporarily halted March 11, when fire broke out in the engine room and caused considerable damage to drilling equipment. The crew was pulling rotary drill stem at 7420 feet at the time of the mishap. Herndon Drilling Company, Tulsa, is drilling this deep test on contract, and was the principal loser. In the same county M. E. Davis (Benedum & Trees) et al's wildcat on the J. D. Sugg land is drilling below 6850 feet, and is also making a try for production in the Ordovician lime formation, which has been exceptionally prolific in the Big Lake field.

Crude output of the eight deep wells on regular production in the Big Lake field during the 24-hour period ending 7 a. m., March 13, was rated at 24,247 barrels, ranging from 43.8 to 55 gravity (corrected). A sharp reduction in the oil and gas flow from Group One Oil Corporation's (Continental Oil Company) University 4-B, which recently increased its output to more than 7300 barrels daily, was made possible by stepping up the back pressure on the casing from 1425 to 1600 pounds. University 2-B, which was recently deepened to 8740 feet, has increased its oil output to 7933 barrels while carrying 1500 pounds back pressure on the casing, and 550 pounds on the tapered tubing. The latter was allowed to produce small quantities of oil through the casing several days last week while also flowing through tubing. Crude coming from the casing tested 63 degrees gravity at 26 degrees temperature, or 67.3 degrees gravity (corrected), and production through the tubing tested 46.7 degrees at 48 degrees temperature.

Big Lake Oil Company is preparing to install a string of tubing, consisting of about 1000 feet of 2½-inch and the remainder to be three-inch, in its University 2-C as a means of lowering the gas-oil ratio. It has a total depth of 8815 feet, and is making 55 gravity crude. University 5-C, which is drilling with rotary below 5670 feet after sidetracking casing, is the only active deep test in the field.

Production and status of the 10 deep well operations in the Big Lake field for the 24-hour period ending 7 a. m., March 13, is listed below:

	Oil production	Gas production	Pounds casing back pressure	Pounds tubing back pressure	Total depth
Big Lake Oil Co—					
University 1-C	564	530,000	520	60	*8908
University 2-C	2052	12,691,000	1200	**	8815
University 3-C	(Closed in)				8923
University 4-C	2900	8,162,000	1400	500	8833
University 5-C	3042	17,197,000	1250	1200	8872
University 6-C	(Drilling)				5670
Group One Oil Corp.—					
University 1-B	297	353,000	70	....	8596
University 2-B	7933	38,479,000	1500	550	8740
University 3-B	3122	11,618,000	350	....	9020
University 4-B	4337	29,490,000	1600	....	8587

*Plugged back to 8715 feet account water.
**Rigging up to install taper tubing.

Decrease Registered in Amount Of West Texas Oil and Gas Leases

San Angelo, Texas.—Total acreage held under lease for oil and gas development rights in the West Texas district by major and independent companies at the close of 1931 is estimated at 7,546,500 acres, or approximately 23½ per cent less than the total reported one year previous. Retrenchment programs resulted in all of the important owners of wildcat blocks issuing cancellation orders on many thousand acres of leases considered doubtful of oil and gas possibilities, while expiration of leases each year account for a large turnover. A concentrated drive was staged by most owners of wildcat leases for a reduction in rentals, thereby yielding a substantial saving on lease carrying charges for the companies.

Figures compiled by scouts indicate that approximately 2,395,400 acres of leases were released during 1931, with about 1,121,000 acres of the total turned back to the fee owners during the last four months of the year.

Absence of an active wildcat drilling program in 1931 prevented a normally large volume of acreage being condemned for production by the completion of dry holes.

Although lease buying in the West Texas district was probably at the lowest level in 1931 that has been experienced in more than a decade, there has been a substantial gain in the volume of trading within the past several months. New deals have been particularly active in areas that give promise of later receiving tests to the deep Ordovician lime, which is profitable in the Big Lake field. Central Crockett County is now the center of activity for this type of play, and is assured two or three deep wildcat tests at a later date.

The bulk of the crude produced in West Texas yields a gasoline product carrying a high octane rating, and no appreciable quantity of crude within reach of a truck line is being sold below the market, even though a high sulphur content generally prevails.

Oklahoma--Kansas Field Notes

FLOYD SWINDELL, ***Staff Representative, Tulsa, Oklahoma***

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Spring Expected to Increase Kansas Field and Wildcat Drilling

Wichita, Kansas.—Indications are that Kansas, with a return of spring weather, will see an early return of activity through development of the new central western or Barton-Ellsworth Arch area and widespread wildcat work as well as reconditioning and deepening campaigns in the older pools. The number of activities increased five during the past week to a total of 170. Of this increase, three were listed as wildcats. By counties the summary shows McPherson County leading with 49 operations, Greenwood is second with 20, Cowley County third with 15, Ellsworth fourth with 13, and Sedgwick fifth with 10. Thirty-nine of the 102 Kansas counties are listed in the field report.

Old Wilcox Producer at Seminole Flows When Plugged Back to Calvin

Seminole, Oklahoma.—Stanolind Oil & Gas Company's Jones 2, SW SE NW Section 20-9n-6e, an old Seminole pool Wilcox producer plugged back to sand in the Calvin series at 2733 to 2760 feet, flowed 891 barrels in 13 hours and was last reported flowing 68 barrels of oil per hour, cutting two per cent b.s. and three per cent fresh water. Operators have had considerable difficulty in recompleting this well. A few weeks ago it made better than 1800 barrels on a 24-hour test, but was cutting, and a decision was made to cement off water. In some way, the producing portion of the sand was cemented along with the water bearing portion, and it was necessary to whipstock out and redrill the sand.

Location Announced for Offset To Kansas' Only Hunton Producer

Wichita, Kansas.—W. C. McBride, Incorporated, has announced location for Frieson 1, NW NW SW Section 20-22s-3w, south offset to Frank Hollow et al's Fee 1, which is producing from Hunton lime at 3507 to 3517 feet. It was completed for an initial production of 120 barrels and operators are now moving some oil by truck. The point of interest is that the Hollow well is the first ever to produce in commercial quantities from the Hunton formation in Kansas. Elsewhere in the state that formation has been found dry and no production of any consequence has been found in areas where Hunton lime has been recognized.

Viola Limestone Wells May Set Up Potential of 80,000 Barrels

Wichita, Kansas.—On the basis of gauges commenced on February 25 and as yet incomplete, it appears that Viola limestone wells of the Ritz-Decker-Garrett area will establish a potential of approximately 80,000 barrels daily. Of the 51 chat well, 42 have elected to take the minimum allowance in lieu of gauging, and it is estimated that the nine chat wells which will be tested will establish a potential of about 12,000 barrels, making the total potential for chat wells 15,000 barrels and for the area approximately 95,000 barrels daily.

Total allowable production for the area for February was 418,725 barrels, and the purchasers were able to take only 374,873 barrels, leaving an underproduction of 43,852 barrels for the month. Potential, as shown by the last report of the umpire, was 120,804 barrels, showing that the pools are definitely beyond their peak and indicating that future drilling, no matter how rapid, probably will not be able to offset the decline.

Fish Pool Well Which Blew Out Now Flowing 500 Barrels of Oil

Seminole, Okla.—Mid-Continent Petroleum Corporation's Bruner 1, NE NW SE Section 9-7n-8e, in the Fish pool of northwestern Hughes County, was reported this week making 500 barrels of oil and 5,000,000 cubic feet of gas from sand logged at 2934 to 2954 feet. This is the test which several weeks ago blew tools out of the hole and was wild for several days before it could be killed with mud. Gas was estimated at 46,000,000 cubic feet at the time of the blow out.

Jarvis and Holmes' Fish 2, SE NW NE Section 30-7n-8e, also in the Fish pool, was being estimated at 100 barrels per hour after deepening from 3051 to 3069 feet. Top of the Wapanucka limestone was encountered at 3005 feet and first oil at 3046 feet. The first increase was noted at 3061 feet and at 3066 feet it flowed 2267 barrels in 15 hours, making it one of the largest completions in the pool which has led Seminole activity for the past few months.

Derby's Barton-Ellsworth Arch Wildcat Well Begins Pumping Test

Wichita, Kansas.—Derby Oil Company began a pumping test Saturday on its Stratman 1, CNE NW NE Section 12-17s-10w, after shooting the Arbuckle limestone with 50 quarts from 3253 to 3283 feet and swabbing 30 barrels the first hour after shooting and 20 barrels the second.

This is the second time the well has been shot, and it appears that production has been increased, although at its highest it does not compare favorably with other completions in the vicinity.

Williams and Moore were still trying to complete their Stratmore 1, SW SW SE Section 23-16s-10w, after having the misfortune to cement a string of tubing in the hole. The reports have not shown exactly what happened, but as near as can be determined the operators were trying to cement casing through a string of tubing and permitted cement to set inside the tubing to within a few hundred feet of the top. The last report stated that all tubing had been removed except the bottom joint and an attempt was being made to drill this out. Siliceous lime was logged from 3388 to 3390 feet, according to corrected reports. At this depth the test showed considerable promise of making a large completion before the present difficulty arose.

Deep Rock Oil Corporation has taken over the interests of Tom Palmer et al in their Pasek 1, CSE Section 3-14-11w, three miles northeast of the town of Dorrance in east-

ern Russell County. Six-inch casing was landed at 3320 feet and the hole underreamed to top of the lime at 3383 feet. Total depth is 3427 feet in lime reported showing oil is to be tested.

Flynn et al have set 15½-inch casing at 360 feet in their Budde 1, CNE Section 16-18s-16w, eastern Rush County wildcat.

Five Completions in Oklahoma City Have Large Initial Yields

Oklahoma City, Okla.—Five completions and four new locations were reported in activities in the Oklahoma City pool during the past week. Calculated on a 24-hour basis, production from the five new wells would total approximately 200,000 barrels daily, making it the banner week of the past few months. Interest was swinging principally to the new southwest area, where eight Wilcox producers have been completed in recent months and a total of 13 rigs, locations, and drilling wells are located.

Development of this area came late in the history of Oklahoma City due to the belief of many geologists that an unusually sharp dip would be encountered and that there was a possibility of the oil-water contact's being too high for production of any importance. This opinion was based largely on the showing of a test several miles southwest of production which found all of the upper formations considerably lower than they were expected. Three of last week's completions were in the new area.

R. A. McArthur et al's Pruitt 1, SW NE NW SE Section 22-11n-3w, approximately a half mile from production but almost midway between completed wells to the northwest and southeast, drilled Wilcox sand from 6440 to 6552 feet, from which depth it flowed 330 barrels in nine minutes, cutting out connections so that it had to be shut in. Gas was estimated at 55,000,000 cubic feet. Slick-Urschel Incorporated's Dodd 1, CW½ SE SE SE Section 22-11n-3w, west offset to Continental Oil Company and Kessler's Canning 1, made 1431 barrels the first hour with 31,000,000 gas. Wilcox sand was logged from 6455 to 6555 feet and drilling continued to 6576 feet. Canning 1 produced 6075 barrels the first five hours from Wilcox sand logged at 6452 to 6561 feet. Wellsley and Phillips Petroleum Company's Cowell 1, SW SW NE Section 22-11n-3w, the third completion in the new area, set 6⅝-inch casing at 6480 feet and at a total depth of 6567 feet, flowed 2872 barrels in four hours along with gas at the rate of 18,000,000 cubic feet.

In the northern portion of the pool, Grissom et al bailed down and shut in without gauging their Turner 1, CS½ SW NW SE Section 34-12n-3w. This test is near Westgate Oil Company's Carey lease, which has been outstanding for its large initial production, and the Turner 1 may exceed the 50,000-barrel estimate placed on it. Continental Oil Company and Anderson-Kerr's Volk 1, CN½ NW NW SE Section 15-11n-3w, produced 961 barrels the first 30 minutes, flowing through a four-inch choke against 250 pounds back pressure. Production is coming from Wilcox sand at 6402 to 6550 feet.

The following new locations were made during the week: Anderson-Prichard et al, Rayhill 2, SW SW NW NE Section 10-11n-3w; Phillips Petroleum Company et al, August 1, NE SW SW NE Section 3-11n-3w; Phillips Petroleum Company et al, Trail 1, CS½ SW SW NE Section 3-11n-3w; and Indian Territory Illuminating Oil Company, M.K.&T. 7, NW SW SW Section 35-12n-3w.

Status of the pool as of March 12 was as follows: five locations, five rigs, six cellars, 19 wells drilling above 5000 feet, five drilling between 5000 and 6000 feet, six drilling below 6000 feet, and three shut down, making a total of 49 operations, of which 30 are drilling.

Allowable of Oklahoma City Field Increased 3000 Barrels

Oklahoma City, Okla.—Allowable production from the Oklahoma City pool received an increase of 3000 barrels daily after the Corporation Commission hearing of March 12, when purchasing companies nominated approximately 105,000 barrels daily for the last 16 days in the month.

Provisions of the new order, which went into effect at 7:00 a. m., March 16, had not been announced, but it was understood that the only change was a reduction of 500 barrels in the daily allowable of properties producing from the Arbuckle limestone, giving this zone a daily allowable of 3500 barrels. This action was taken after it was shown that wells in this zone produced an average of only 3715 barrels daily the first 11 days of March. Daily average runs for the first 10 days in March, compared with the new nominations by companies were as follows:

	Daily Average Runs March 1-10	Nomination for Last 16 Days
Champlin	647	647
Continental	2,196	2,000
Empire	18,164	18,000
Globe Refining	6,543	7,100
Magnolia	6,179	7,500
Oklahoma Pipe Line	17,079	18,000
Operators	2,603	2,603
Prairie	604	604
Shell	11,054	12,000
Sinclair	9,168	9,000
Stanolind	20,808	20,000
Tidal	143	143
Wilcox	1,533	(a)
Anderson-Prichard	19	...
Canadian (b)	143	500
Capitol P. & R.	59	59
Century Petroleum	1,232	1,500
Peacock	203	203
Petroleum	245	3,500
Salem	1,711	(c)
White Oak	194	2,000
Major Petroleum	...	205
Totals	100,527	105,564

(a)—Over-produced and ordered shut-in. (b)—Canadian and York Refining Company the same. New nomination made by latter company. (c)—Salem out of market since turning refinery back to Century. Major Petroleum is a newly incorporated purchaser.

Umpire Ray M. Collins testified that Wilcox Oil & Gas Company is over-produced, and stated that it would not be allowed to produce or deliver any of its crude during the last 16 days of March. Instructions were sent to Magnolia Petroleum Company to discontinue runs from the properties of this company.

The 3000-barrel increase in allowable probably will be applied to assist in relief of the under-production and underrun problem which Collins believes will be cleaned up early in April.

Estimated stocks on hand as of March 1 were reported by E. G. Dahlgren, member of the umpire's staff, to be 776,525 barrels, or a reduction of 266,102 barrels below the estimate as of February 1. Dahlgren further estimated that during the last 16 days of March there would be 675 wells, with a total adjusted potential of 3,237,024 barrels, eligible for production. There are 91 wells reported making three or more per cent water.

According to figures and estimates of the umpire's office,

production the first 15 days of March totaled 1,593,645 barrels, and pipe line runs for the same period 1,507,950 barrels, indicating that on March 16 stocks would be about 862,220 barrels and the current over-production approximately 46,307 barrels. Deferred underproduction as of March 16, was estimated to be 1,003,027 barrels compared with 2,950,078 as of February 1, or a decrease of 1,947,051 barrels during the past 44 days.

Under the order which governed the period March 1 to 15—43,450 barrels daily were allocated to deferred underproduction on 10,000 barrels daily to current under-production. Assuming that no current under-production will be accumulated during the last 16 days of the month and that the new order will allow an equal or greater amount to under-production, this item should be eliminated in a maximum time of 18 days or by about April 2.

Status of Oklahoma City Pool as of March 1, 1932

Company—	No. of Wells	Corp. Comm. Potentials	Net Allowable For February	February Production	Stock 7 A.M. Feb. 1	Feb. Runs	Stock 7 A.M. Mar. 1
Acme	1	17,255.70	8,693	7,490	1,098	7,553	1,035
Addition	1	19,216.72	15,021	15,872	2,083	15,572	2,410
American	1	13,047.00	2,621	2,635	800	2,933	500
Anderson-Kerr	1	10,907.48	2,198	2,190	609	2,449	352
Anderson-Prichard	27	115,672.58	148,555	136,005	37,182	144,022	29,080
Argood	1	96.40	8,433	3,943	469	4,215	194
Blackstock	1	1,774.48	388	292	134	835	292
Blackwell	5	28,357.50	16,730	16,730	7,653	14,494	9,809
British-American	9	86,631.60	38,481	38,313	8,538	40,556	6,292
California	1	313.10	3,670	1,138	3,602	....	4,739
Capitol P. & R.	2	19,494.44	6,605	2,367	761	1,294	1,656
Capitol Prod. Tr.	1	13,052.48	9,568	11,710	1,610	8,654	4,580
Century	5	42,643.46	34,870	35,166	16,295	40,441	11,016
Champlin	10	32,821.22	—122,926	8,942	6,843	10,976	4,870
Chatham	2	28,264.80	12,914	12,898	1,913	13,213	1,600
Coline	34	19,147.77	39,539	38,657	26,177	44,935	13,819
Continental	11	67,952.88	1,294	46,059	23,810	33,975	35,833
Courter	1	5,607.00	2,414	3,617	2,283	4,115	1,785
Cromwell-Franklin	32	90,113.82	82,313	89,868	65,957	83,062	71,171
Dabney-Johnson	1	4,260.00	2,436	2,435	1,290	2,999	738
Danciger	1	10,279.50	41,117	2,835	4,784	5,474	2,145
Denver	6	54,279.92	26,257	32,370	12,494	31,331	13,539
Denver-Reynolds-Pl.	1	12,216.82	16,661	16,663	6,231	18,311	4,585
Dengail	4	28,113.60	35,366	35,370	18,400	43,713	10,055
Donleon	2	27,768.20	8,564	8,798	3,509	10,753	1,553
Eason	3	28,499.42	8,284	7,975	4,376	10,065	2,284
Empire	3	16,409.95	22,154	22,258	3,713	22,774	3,198
Franco-Dominion	1	12,506.80	12,187	....	6,858	2,810	4,048
Franklin Wirt	39	72,895.46	98,501	95,241	64,780	105,000	54,994
Great Southern	1	5,941.20	2,645	1,150	4,969	2,619	3,500
Government	2	9,980.20	2,938	3,222	6,955	7,570	2,588
Hall & Briscoe	1	2,079.00	2,218	2,145	30	1,845	335
Holman Ed S., Inc.	1	3,352.20	6,931	3,403	1,448	2,581	2,270
I. T. I. O. Co.	293	537,321.55	540,734	540,398	304,347	640,100	189,666
Kedberg	1	474.00	—28,606	....	463	....	463
Kessler	1	3,727.50	—183,695	....	843	....	843
Mabee	4	48,278.61	36,062	36,128	1,476	36,228	1,382
Marco	1	.....	....	....	247	....	247
Marshall	3	15,208.00	2,929	4,208	11,118	12,955	2,371
McArthur	2	27,402.88	5,270	5,326	3,280	6,406	2,409
Mid-Kansas	7	5,811.10	6,309	6,307	4,222	6,623	3,925
Minnehoma	1	18,886.22	8,176	8,608	597	8,613	595
Morgan	3	32,559.48	12,969	13,064	1,432	13,777	720
Ocate	2	21,022.00	12,135	12,467	1,626	10,827	3,251
Oils, Inc.	4	32,436.54	25,409	25,362	3,722	26,520	2,564
Paine & Johnson	1	10,853.82	7,546	1,541	8,383	2,865	7,086
Peacock, John H.	3	2,981.04	18,780	5,742	3,293	6,735	1,867
Phillips	62	662,021.04	403,861	410,952	156,562	426,440	136,778
Plains	2	10,028.60	1,490	1,630	824	1,630	822
Prairie	14	7,142.56	25,763	25,688	2,781	26,945	1,524
Rajah	1	14,569.32	4,779	4,480	985	4,222	1,231
Reynolds & Unruh	1	8,254.96	6,071	5,087	4,494	8,120	1,461
Refiners Prod.	2	.....	....	3,587	....	3,215	318
Russell	2	21,122.00	17,869	19,503	9,037	20,798	7,748
Scott & Co.	2	433.12	5,108	2,938	2,675	37	5,584
Shaffer, J. C.	6	30,589.04	17,227	19,905	5,006	19,369	5,569
Shell	8	1,487.58	14,937	12,170	1,645	13,194	682
Sinclair	54	97,466.06	56,922	54,411	19,434	54,639	13,021
Skelly	23	105,448.34	48,438	43,056	25,318	56,347	11,728
Slick-Urschel	100	493,116.66	338,007	327,393	29,908	341,270	56,017
Springrose	1	13,019.86	4,110	4,064	1,407	4,070	767
Stauffer	1	9,919.54	398	1,409	273	1,602	79
Sunray	4	54,366.72	25,411	25,418	27,723	35,013	18,058
Watchorn	1	15,341.12	6,227	....	9,320	....	9,320
Westgate	7	90,310.06	61,745	71,371	9,046	76,022	4,308
Wilcox	10	79,434.00	20,454	17,414	3,083	14,740	5,718
Wrightsmith	2	2,882.00	4,725	4,735	5,891	4,225	6,401
Totals	841	3,374,868.02	2,088,198	2,422,119	1,048,115	2,624,686	811,388

News From California Fields

BRAD MILLS, *Staff Representative, Los Angeles, California*

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New Entry Seeks Extension Of North Dome Production

Coalinga, Calif.—An effort to extend the North Dome will be made by North Kettleman Oil & Gas Company, a recently organized company which will drill a well on the northwest quarter of Section 24-21-16 and about 2¾ miles northwest of Superior Oil Company's Huffman 1. The location is a short distance outside of the "blue" line which is recognized by the Kettleman North Dome Association as the most remote point at which production may be found, but the structure apparently plunges more gently toward the northwest than in other directions. A large oil company supposedly advanced the company a certain amount to help drill the wildcat test, but no official announcement to this effect has been made.

North American Oil Consolidated has not solved the water problem in Elsinore 1, an edge test on the North Dome which showed considerable water on a recent production test at 8713 feet. Opinions differ as to whether the water is coming from above the producing formation or from it. Water in the top of the Temblor formation in edge wells is not unusual, but water from the lower part would indicate an extreme edge condition. The fact that the well made only a small amount of gas does not definitely brand the zone as wet. The gross flow was above 2000 barrels, but the water cut increased to 40 per cent. The 6⅝-inch shutoff was made at 8356 feet.

North American Oil Consolidated's Blauvelt 1, located half a mile from Elsinore 1 and an extreme edge test on the North Dome, remains idle at 9500 feet. Freezing of the drill pipe at about 8800 feet prevented a continuation of operations. A string of 9⅝-inch casing was cemented at 8485 feet in this well to establish an unusual record. The formation showed a small amount of oil, but the well is definitely a questionable test.

Petroleum Securities Company has been unable to pull the drill pipe in Burbank 1, Middle Dome test which was drilled to 9332 feet and tested above the plug at 9208 feet. The company is trying to back off and pull the lower portion of the drill pipe which has been recovered to around 5180 feet. Indications are that the 8⅝-inch water string is faulty. The well has developed into a very doubtful test, following a surprisingly good performance under adverse circumstances.

Standard Oil Company of California is drilling out the cement at 7538 feet in No. 6-29V, Middle Dome test, which may become the first producer in this part of the field. The 8⅝-inch casing was cemented at 7513 feet. The last core showed a streak of gray sand.

Coalinga Wells To Be Opened To Check Condition of Casing

Coalinga, Calif.—The opening and testing of wells in the old Coalinga field by Shell Oil Combpany will mean at least the temporary revival of field activity in an area which has been very quiet since 1922. The company will open and test more than 350 wells in groups to determine the condition of the casing, hole and producing formation. The condition of the casing in many wells is very questionable. From 2000 to 4000 barrels per day of heavy oil will be produced during the testing of the 350 wells. Since Coalinga crude makes good lubricating stock, reports have been circulated that the opening is for the purpose of producing more oil for this purpose. Shell Oil Company stated that the resumption of operations was not for this purpose. The oil also makes a good grade of gasoline when cracked, but the limited cracking facilities of the company hardly justifies a large production for this reason. The Coalinga field has produced from various levels for a generation. The field is made up of a monocline, a syncline and an anticline, the shallow monocline to the west having produced first. Sand and water have caused trouble for 20 years, piles of sand by wells being a very common sight.

Old Buttonwillow Test Will Try Further for Production

Bakersfield, Calif.—Wilshire Oil Company has resumed operations in Salisbury 1A, a deep test on Section 7-29-24 which has been suspended since last summer, and will attempt to place this very interesting Buttonwillow well in condition for deepening from 6990 feet or testing of gas showings above bottom. A string of 6⅝-inch casing was cemented at 5017 feet to stop caving, but the hole was drilled below this point only with much difficulty. The district has long been famous for the heaving shale which baffled early operators. Even after reaching a depth of nearly 7000 feet, this caving condition persisted and the hole is not open a considerable distance below the shoe of the 6⅝-inch casing. The district has been prospected for gas and oil for several years and a good gas production has been developed in the area.

Milham Exploration Company, California subsidiary of Seaboard Oil Company, has been active in the district and has completed several good gas wells. The most recent effort was the drilling of Whitaker 1, Section 8-28-23, to 2500 feet in about a week to test that shallow gas zone. A string of 8⅝-

LOS ANGELES. — Major companies that have turned a deaf ear to land deals of all sorts during the past two years are gradually getting in a more receptive mood, and the market for attractive wildcat acreage has shown a slight improvement. Some of the doubtful acreage is being quitclaimed and the cleaning out process should place the market in a stronger technical position. It is still next to impossible to sell the very doubtful acreage, but the rivival of interest in the flat districts of the San Joaquin Valley indicates that where very low rentals prevail, companies are still willing to take a chance. Leasing in the Los Angeles basin has been negligible for more than a year. Santa Barbara County acreage has moved a little better. The shift toward the northern counties has been noticeable, but the hope of natural gas production has largely prompted this change. Leasing will not show a decided increase until the demand for oil at least equals the supply.

inch casing was cemented at 2483 feet and the well will be deepened to include the zone which has been productive in other wells.

Second Ventura Avenue Deep Test Having Water Trouble

Ventura, Calif.—Associated Oil Company failed to develop a satisfactory production in Lloyd 83, a deep test in the Ventura Avenue field which was drilled to 8571 feet, but the source of the water may be traced to an imperfect shutoff. Nine-inch casing was cemented at 8130 feet and the fact that three attempts were required to secure approval of the water shutoff indicates that the trouble may be around the shoe of this casing. Shifting of the 4¾-inch liner necessitated a fishing job. The large percentage of water was a distinct disappointment in this well, which was the second drilled to test the new deep zone which produced so satisfactorily at 8800 feet.

Bolsa Chica Oil Corporation has not decided on a plan to complete Hartman 6, a deep test which was drilled to 8611 feet and plugged back to 7850 feet after encountering water near bottom. This well searched for the "57" zone but failed to find it productive.

Shell Oil Company has made a location for Taylor 73 and will start drilling immediately.

Round Mountain-Mt. Poso Area Activities Confined to Routine

Bakersfield, Calif. — Development in and near the Round Mountain and Mt. Poso fields has been confined to small operators who are fulfilling lease requirements or who are attempting to develop production with a minimum expenditure. It has been definitely established that crude from these fields makes good gasoline when cracked, but the recovery from such heavy oil is naturally much smaller than from the lighter oils. Modoc Petroleum Corporation tested No. 1 on the pump at 1626 feet, and will drill three more wells after the completion of the first test. Extension of these fields would result in increased field operations under more normal conditions. The Round Mountain field has not been so well defined as some of the heavy producing districts. Oil from this area makes good lubricating stock and a good cracked gasoline. The gasoline content on a straight run analysis is low, but the newer methods recover a much better percentage. Both the Round Mountain and Mt. Poso fields have the advantage of shallow producing zones and wells may be completed at small cost.

Fruitvale Drilling Increase Follows Wells in Doubtful Area

Bakersfield, Calif.—Fourteen wells are now active in the Fruitvale field and more locations will be made to complete plans of some of the smaller operators. Two or three completions in the northeast part of the field and in a sector which was considered doubtful until a short time ago started the present development of leases to the west. Western Gulf Oil Company recently started four wells on Section 21- and 22-29-27 and will do considerable field work in a district where no activity was planned for the present. It is interesting to recall that this company quitclaimed leases on which wells have been completed recently. There is some difference of opinion as to whether the structure is a wholly independent one or whether it bears a direct relation to the Kern Front contour lines. The northeast extension lends some weight to the theory that production may lead toward the edge of the valley and not strictly in a northwest—southeast trend. Mohawk Petroleum Company has started three wells on Section 21-29-27 which are indirect offsets to those recently started by Western Gulf Oil Company.

Dominguez Potential Increase Follows Necessary Field Work

Los Angeles.—Dominguez has been the only Los Angeles basin field to increase its potential during the past six months, but the jump is not viewed with alarm. Union Oil Company, Shell Oil Company and Associated Oil Company control the acreage in this field and will hold to the allowables set from time to time. The present deep drilling was caused by lease requirements and was not prompted by the desire of any company to increase the field potential. Union Oil Company has completed several good producers and is now drilling four wells. J. E. O'Donnell has acquired the United Oil Company lease on the southeast tip of the structure and will deepen No. 2 from 4450 feet. Associated Oil Company plugged back to 4500 feet in De Francis 12 and should make a satisfactory completion at this depth. The well was tested at 4667 feet. The Dominguez field has developed into one of the most consistent producers in the Los Angeles basin, the lower Callender zone having proved a consistent formation.

Streaks of Sand Below Usual Depth Interesting at Lawndale

Los Angeles.—Some interest has been awakened in the Lawndale field as the result of a series of production tests in J. O. Smith's No. 9, a well which was drilled through streaks of oil sand below the completion point of the few producing wells nearby. Swabbing the 6365-foot hole brought oil and water, but the flow was small and unsteady. The tubing will be pulled and the hole cleaned out for another test. Cores taken below the last shutoff showed streaks of oil sand. The few producing wells on the west side flowed from above 6000 feet, and the present depth is a test of a new level. Search for a continuation of the zone to produce first proves that the higher formation did not extend to the east, as indicated by surface markings. The fact that a few wells were completed as clean producers leaves some room to believe that a larger production may be developed and that deeper producing zones may be found.

Bakersfield, Calif.—A continuation of the decline of the potential of leading light oil fields should justify increased exploration work in promising districts of Kern County, but no spectacular climb should be expected in wildcatting. Conditions have been such that it has been useless to develop a larger production of heavy oil in the face of a smaller demand. Some grades of this heavy oil, however, make the best gasoline, and increased cracking facilities may help to create a better demand for heavier oils. The San Joaquin valley has played second fiddle for a long time, but 20 years ago it was replacing the older fields to reach the top position. The shift was caused by the demand for lighter oils produced in the Los Angeles basin.

Cheyenne, Wyo.—Congressman Vincent Carter of Wyoming has presented a bill in the House of Representatives which would automatically extend for two years the rights of prospectors' permits to develop oil and gas on the public domain. This is Mr. Carter's second bill presented this session having to do with the oil industry. The first would provide for a label on all imported petroleum products on stations at which they were sold.

Browning, Mont.—Green caving shale has been cemented off at 2950 feet in the wildcat test on Milk River structure, being drilled by Fulton Blackfeet Petroleum Company, in Glacier County, northwestern Montana, on the Blackfeet Indian reservation. This test will be drilled by rotary as soon as rig and equipment can be moved in to location.

New Mexico and Rocky Mountain Area

Heavy Explosion in Lime Results In Large Completion in Lea County

Hobbs, N. M.—The California Company's State-Meredith 1, located on the lower end of the Eunice pool, Lea County, was converted into one of the largest producers in the area as result of a heavy shot in the regular lime horizon after an unsuccessful deepening job. It is rated good for 1000 barrels daily, but is subject to proration, which places a limit of 50 barrels oil daily, with a Sunday holiday.

This well was a small producer at 3950 feet when first placed on production late March, 1931. It was killed May 26 to deepen, and after a series of mishaps encountered sulphur water at 4000 feet. The hole was plugged back to its original depth and given a shot of 240 quarts March 9 at 3874-3935 feet, making 597 barrels fluid during first 11½ hours. During the following 24 hours the well flowed 925 barrels oil and about 7,500,000 cubic feet of gas, with 70 pounds back pressure carried on the trap. Less than one per cent water showed on the latter gauge.

Southern Montana Activities In Field and Wildcat Tests

Red Lodge, Mont.—Several operations are under way in Carbon County, southern Montana, both in the Dry Creek field and on wildcat locations. At Dry Creek, Ohio Oil Company announced a location in the eastern section of the field, on the Margaret Caldwell lease, Section 17-7s-21e, about midway between Carbon Oil & Gas Company's completed well and the one it is drilling on the McMinn lease. Ohio Oil Company's William Robinson 2 is standing cemented at 195 feet where caving formation was shut off. The same company's Industrial 2 is making good progress and at last report was drilling at 2810 feet. Carbon Oil & Gas Company's well on the McMinn lease is drilling with rotary below 2110 feet. All operations in the Dry Creek field are utilizing electricity for power.

On the Golden dome structure, east of Dry Creek field, the Ohio Oil Company's Kutchinski 1 is drilling below 4243 feet. Northeast of the Dry Creek field Midland Oil Syndicate's wildcat test on the East Bridger structure, has been resumed and is drilling around 150 feet. East of the Golden dome well, Jack Creek Oil Company is skidding rig to start new hole on the Jack Creek structure; the first hole was lost at 1335 feet and the well is plugged and abandoned. Corbett Royalty Company's wildcat, southeast of the Dry Creek field, on the Blue Creek structure, is last reported to be resetting 8¼-inch casing at 1120 feet, where a small showing of oil is reported.

Cheyenne, Wyo.—Entirely due to the recent decision in the United States supreme court on a case from Montana wherein it was held that proper state departments have jurisdiction in fixing the maximum rates which may be charged for natural gas but have nothing to do with the minimum rate, the city attorney of Cheyenne is seeking to re-open the matter of the price charged for natural gas there. Cheyenne is furnished natural gas by the Colorado-Wyoming Gas Company which secures its gas from the Texas Panhandle.

Moving in Material for Test In Morgan County, Colorado

Greeley, Colo.—Platte Valley Petroleum Company announced last week that it would drill a test immediately on the Edith Campbell property in Morgan County, about a half mile east of Continental Oil Company's Gadbois well. Cellar is completed and materials are being moved in. It is said that this well probably will be completed eventually by one of the major operators in the district, although Platte Valley Petroleum Company itself will start the work. The company drilled the discovery well in the Greasewood Flats field, and started all the excitement in northeastern Colorado last summer. No discoveries of any particular importance were made, although two more wells were completed on the structure. This year Platte Valley Petroleum Company will drill three wells, and it is believed that other operators will explore territory in the district about which little is known, geological indications being few.

Shelby, Mont.—The decision recently handed down in the Supreme Court of the United States on the case originating in Shelby will have a very far reaching affect upon natural gas distributing companies. The decision, in effect, means that utility commissions in various states may establish a maximum rate at which natural gas may be sold to consumers, but that the commissions have no legal right to fix a minimum rate. The issue was raised in Shelby when a gas rate war broke out between Great Northern Utilities Company and Citizens Gas Company, and resulted finally in the former setting a charge so low as 20 cents which the Montana Public Service Commission set aside as unreasonable and fixed the rate at 35 cents for both companies supplying Shelby.

Chester, Mont.—Test being drilled by Peoples Oil & Gas Company on the east flank of the Bears Den field in the Sweetgrass Hills, Liberty County, northern Montana, has resumed after having been shut down for some time at 2000 feet. A string of 8¼-inch is to be run to shut off water at 1965 feet in the Colorado shale.

Rawlins, Wyo.—Until weather conditions are improved, the test being drilled on the northwestern part of the Mahoney Dome field, in Carbon County, can not be drilled deeper from its present depth of 3740 feet where there is a good showing of free oil reported.

Berthoud, Colo.—Mayer Oil Company has reported showings of oil and gas in its wildcat well on Berthoud structure, in Larimer County, Colorado. The hole is bottomed at 3100 feet, according to last report.

Denver, Colo.—Interest is again manifest in the wildcat well being drilled near Aurora, in Arapahoe County, just outside the city limits of Denver, by MacDeb Drilling Company which has reported a showing of high gravity green oil in the hole which has been standing for some time at 5920 feet. A string of 4¾-inch casing was landed on bottom and drilling deeper continues with a special three-inch bit.

East Central Texas Field Notes

H. H. KING, ***Staff Representative, Fort Worth, Texas***

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Late Locations Indicate East Texas Drilling Will Continue

Tyler, Texas.—Proration allowance of wells in the East Texas field was scheduled to be reduced from 75 to approximately 70 barrels daily early this week by the Texas Railroad Commission and the military authorities, acting under instructions from Governor R. S. Sterling. The field has been allocated a maximum quota of 325,000 barrels daily, with provisions made by orders now in force to adjust the well allowable on the first and sixteenth day of each month so that the output will not exceed the figure agreed upon by the two proration enforcing bodies. Completions in the field at the start of the present week had increased to more than 4460, and if the weather remains favorable the number will be above 4600 before the close of March.

Technically the commission's orders are restricted to the leases of the 12 independent companies and operators that have obtained temporary injunction in Federal Court against military interference, while the remainder of the field is operated under the direction of Governor Sterling, who is in turn represented in the field by the state troops. Close co-operation now prevails between the two enforcement bodies, with orders issued effective February 26 by the commission applying.

Authorization given during the past week for the drilling of 75 locations assures the East Texas field a continuation of its present rate of development work, which has been averaging slightly above 10 completions daily. With few exceptions, these locations are against property lines, and automatically call for offsets that will serve to maintain a high rate of drilling for an indefinite period. Approximately 2000 leases are now on production in this field, while a few tracts within the proven area are awaiting the drill.

Several large producers were added to the lower portion of the field late last week. Stanolind Oil & Gas Company and Pure Oil Company's W. H. Siler 1, located in the northwest corner of a 949.6-acre lease, gauged 45 barrels on 15 minute open tubing test from woodbine sand and shale at 3577-3612 feet. Mid-Kansas Oil & Gas Company's H. C. Burton 1 flowed at rate of 190 barrels per hour through open tubing at 3642 feet.

Pumpers Likely on North Edge

A half dozen completed wells along the north edge of the East Texas field in Upshur County are likely to be added to the list of pumpers shortly, as some of these recent completions are not capable of flowing their production allowables. W. F. Sorrells-Owens et al's A. N. Brawley 1, located in the lower northwest corner of the M. Mann Survey, is flowing between 70 and 80 barrels oil by heads every 48 hours from sand at 3743-3753 feet, with a sub-sea depth of about 3310 feet. Plans are to defer the installation of pumping equipment until these heads cease. Saturn Oil Company's W. F. Smith 1, located on 25-acre lease, J. M. Pineda Survey, and northeast of a dry hole on Sun Oil Company's A. J. Watkins lease, failed to produce when tested at 3688-3716 feet, and will be deepened. At the latter depth the hole was reported to be 3314 feet below sea level, and bottomed in shale and red beds. Steen Drilling Company and Meadors' J. F. Phillips 1, located on 96-acre lease farmed out by Shell Petroleum Corporation, is reported to be flowing by heads, but making its allowable. The latter was completed late in January at 3653-3667 feet. Phillips 2, located on the same lease is also a light producer, having penetrated only 12 feet of sand, with the hole bottomed at 3685 feet, or 3283 feet below sea level, rather than to risk water.

Humble Oil & Refining Company's D. C. Shelton 1 is averaging about 25 barrels oil daily by heads, and C. T. Shelton 1 is making heads in sufficient quantity to cover its allowable, while the same company's Eva O'Byrne 1-C is likewise flowing by heads. All of these are making cut oil, according to a late report on water wells by the field staff of the Texas Railroad Commission.

Only a few wells have been added to the list of those making salt water, and a recent survey of the field made by W. P. Knode, chief petroleum engineer for the Texas Railroad Commission, reveals 52 active producers making from a fraction of one per cent to 80 per cent water. Eleven additional wells that showed water, but are now dead, are also included in the report.

Pumpers Now Flowing

A re-check by scouts on the status and number of pumping and dead wells in the Joiner section of the East Texas field during the past week reveals a return to natural flow by heads on some of the old pumpers, while a number recover their allowable of 75 barrels of oil daily in a shorter period than formerly. This change is believed to be due to a general equalization of reservoir pressure, and almost complete cessation of the policy of blowing new wells into pits for a number of hours upon completion. An outstanding example of this improved condition is cited by the performance of two pumpers on the Deason lease, M. J. Prue Survey, belonging to Harry S. Moss and Pete Urschel. These wells were yielding about 20 barrels oil each from full 24 hours pumping, but are now making their allowables in about 16 hours. This property is too far removed from the basin side of the field to have benefitted from an advance of the water table upon the structure.

Resumption of natural flow of pumping wells in the Kilgore area has also been noted lately. Sinclair Oil & Gas Company's Major Kennedy 1, Hy. Hobson Survey, Rusk County, is credited with having started flowing its allowable last week after pumping regularly for more than six months. This producer is on the east edge of the field, and failed to flow when completed last August.

East Texas Production

Official data on proration enforcement in the East Texas field, as compiled each day by the military authorities, is listed below for the past week:

Period ending 7 a.m.	Total wells completed	Wells reporting prod.	Wells off prod.	Wells not reporting	Pine line runs	Total prod.	Daily average per well
March 7.....	4393	4178	133	192	87,615	306,627	73.7
March 8.....	4403	4067	39	297	174,372	300,813	73.9
March 9.....	4417	4060	35	322	382,047	300,211	73.9
March 10.....	4433	4196	40	197	368,646	310,079	73.9
March 11.....	4441	4233	46	162	278,427	312,058	74.4
March 12.....	4450	4208	48	194	375,556	312,595	74.5
March 13.....	4467	4197	49	221	401,514	311,715	74.2
March 14.....	4473	4111	45	317	118,041	305,850	74.1

Note—Pipe line runs include receipts plus crude used as fuel and road oil and for washing in wells.

Federal Court Restraining Orders Aid Enforcement of Proration Rules

Tyler, Texas.—The Texas Railroad Commission, through the aid of the attorney general's department, has become as adept in placarding would-be violators of proration rules in the East Texas field with Federal Court restraining orders as opposing operators who have been in throwing off military interference. Temporary injunctions have been granted the commission against 10 companies and operators by Federal Judge Randolph Bryant to restrain the defendants, who had previously enjoined the governor and the military authorities from enforcing their proration orders.

Pending the dissolution of the injunctions these operators are more securely bound by the commission's proration rules than all other property owners. Operators cited by the commission's cross-action suits must answer to a federal judge for contempt of court should they be caught exceeding the production allowance per well. On the other hand operators that have not participated in the injunction barrage are virtually immune from punishment, except to have wells closed down until excesses are made up, when caught producing more oil than permitted by the rules.

The following operators were enjoined by Judge Bryant from violating the commission's orders last week: North Star Oil Corporation, Imperator Oil Corporation, T. W. Murray (M. & G. Oil Company), Bill & Dave Oil Corporation, A. S. Palmer et al, Lidge-Rowe Oil Company, Inc., and Lide-Tayloe Oil Company. Others were restrained by court order the previous week.

Wildcat Fills a Mile of the Gap Between Jamestown and East Texas

Longview, Texas.—A preliminary production test given E. E. Eslick-M. T. Flannigan et al's semi-wildcat on the H. F. Whitehurst 20-acre lease, located within a mile from the north outpost producer of the East Texas field and on a direct line towards the discovery well of the Jamestown area, Upshur County, revealed a heavy flow of pipe line oil through drill stem at 3701 feet.

Assuming that the depth of Whitehurst 1 has been announced correctly, it is producing from a sub-sea depth of 3359 feet. The Woodbine sand usually carries water when found at a similar, or greater, sub-sea depth in the East Texas field.

Indications point more favorably to Whitehurst 1 having tapped the same oil horizon that netted Cranfill-Reynolds Company et al, discoverers of the Jamestown area, a light flowing well January 29 after drilling to a sub-sea depth of 3398 feet, with a faulted condition prevailing between the two areas. The discovery well on the Rash 106-acre lease E. N. Eubanks Survey, is making 35 gravity oil, and Whitehurst 1 tested 34.3 degrees gravity at 64 degrees temperature. This oil is of a lower temperature, and about five degrees gravity below the average maintained by wells in the main field.

E. Slick et al's Whitehurst 1 is located in the southwest corner of 20-acre lease, McKinney & Williams Survey, and about 2¼ miles southeast of the Rash producer, which is flowing about 75 barrels daily by heads with the aid of oil circulation obtained by pumping oil into the hole at intervals. The drill stem test was made March 10 in the presence of a large group of scouts. It satisfied all present that Whitehurst 1 will make a good producer when casing is cemented and the well properly completed. Pecan chalk was logged at 2410-2910 feet, and top of Austin chalk at 3616 feet, with a surface elevation of 342 feet. Top of the sand is placed at 3688 feet.

An interesting depth will be reached shortly by tests drilling to the east and north of the Rash discovery well. J. K. Wadley and J. P. Evans' Oliver 1, Sophia Sanders Survey, logged first broken Pecan chalk at 2354 feet and top of hard chalk at 2435 feet, with a surface elevation of 373 feet.

Territory east of the producer is being explored by J. C. McFarland's (Phillips Development Company) Willie Starr 1 (96-acre lease), C. H. Cooper Survey, and the top of the first Pecan chalk was reported at 2323 feet, with first hard chalk at 2372 feet. The latter has an elevation of 274 feet.

Operators and Royalty Owners Organize to Foster Proration

Tyler, Texas.—A new organization to be known as the East Texas Oil Club was formed by a group of independent operators and royalty owners with holdings in the East Texas field on March 8 to voluntarily aid state authorities in enforcing proration and conservation rules governing operations in this particular field. H. L. Hunt, Tyler, operator with extensive properties in the field, was elected chairman, and Rade Kangerga, Henderson, royalty owner, was selected vice-chairman. The executive committee includes the above two officers and the following members: Jake L. Hamon, Jr., Longview; Roy Laird, Kilgore; and Paul L. Meaders, Tyler.

Administration of the affairs of the new organization will be largely placed in the hands of a committee of 21 operators and royalty owners. The personnel of this committee includes the following: Freeman W. Burford, Dallas; Earl Calloway, Dallas; W. C. Stroube, Corsicana; Harry Reynolds, Houston; Maxie Wilson, Overton; W. B. Hamilton, Wichita Falls; Paul Snetcher, Fort Worth; Marvin Kelly, Clifford Mooers, F. K. Lathrop and G. O. McCreight, all of Longview; R. W. Fair, Ralph Johnston, Arch Rowan, W. A. Wise and William McCullough, all of Tyler; and the above officers and members of the executive committee.

Organizers of the East Texas Oil Club have announced that no conflict will be made with the activities of other oil bodies, and that its members will be pledged to abide by conservation orders of the state as well as to report such violations as may occur. It is further provided that a committee will be appointed to appear before the Texas Railroad Commission at future hearings on the East Texas field and sponsor additions and changes in rules that will be for the best interest of producing properties in the field.

Pampa, Texas.—Partial destruction by fire of the H. F. Wilcox Oil & Gas Company's crude refinery here March 12 cost the life of R. H. Bell, 40, and serious burns to five other employes.

Several months will be required to restore the plant to regular operations, and plans are being made to divert the crude supply to other marketing channels in the meantime. The company is producing approximately 900 barrels daily from its own properties in Gray County.

Pampa, Texas.—Shamrock Oil & Gas Company is reported to have contracted to acquire the Apache Refining Company's 5000-barrel capacity skimming plant, located at Sunray, Moore County, Texas, and will re-condition the equipment to operate on controlled crude in the nearby Dumas field. The plant was erected last year to operate on production developed by the Sunray Oil Company, and this supply will also be available. It is reported that an attractive fuel oil contract held by the plant owners with the Rock Island Railroad is also involved in the deal.

South Texas Field Developments

EARL POST, *Staff Representative, San Antonio, Texas*

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Humble's O'Conner 2 in Refugio County Logging Higher Than No. 1

San Antonio, Texas. — Humble Oil & Refining Company's O'Conner 2, wildcat in northern Refugio County, is logging higher than the O'Conner 1, which made 750 barrels initial through a 5/16-inch choke from 4127-55 feet. O'Conner 2 has set 13⅜-inch casing at 2314 feet to cut off a gas sand and will resume drilling to the lower horizon.

O'Conner 2 is in the J. Keathing Survey, 12,625 feet from the south and 8158 feet from the east line. It is 933 feet north 75 degrees east of the first well.

At 2232-40 feet, O'Conner 2 showed 1000 pounds pressure in three minutes through a three-eighths-inch choke. The first well had this horizon at 2300-09 feet and showed 800 pounds in the same length of time on a three-eighths-inch choke.

Three Completions Recorded This Week in Fields of Duval County

San Antonio, Texas.—Three completions, all in separate pools, have been completed in Duval County.

The most outstanding well is the Cole Petroleum Company's R. V. Benavides 75, Cole field, which showed for a 40,000,000 cubic foot gasser through two-inch tubing, gauging 590 pounds pressure. The depth was 3012 feet and the casing was set about 3000 feet. The well is in Section 19, Block S, Arispe Survey, 150 feet from the northwest and 410 feet from the northeast line. This test has been killed and is being drilled deeper. It failed to make a producer in the regular 1700-foot horizon, and the owners have decided to make a deep test.

S. R. & C. Oil Corporation's Duval Ranch 7, 300 feet north of Duval 6, Section 296, G.C.&S.F. Survey, has been completed for 300 barrels from the sand at 1736-45 feet. It is in the S.R.C. pool.

Thomas and Tarver, Incorporated's Bishop 6, Section 135, Government Wells field, is flowing about 500 barrels from the sand at 2372-84. Casing is set at 2353 feet.

Tidal Will Attempt to Work Out Guadalupe County Structure

San Antonio, Texas.—An attempt will be made to work out the structure discovered two years ago by the Tidal Oil Company's Seligman 1, Guadalupe County. This well showed about 200 barrels a day from the Austin Chalk, but soon ceased producing. It was then deepened to the Edwards lime, developing sulphur water.

The newest Tidal Oil Company well is the Black 1, located 1231 feet from the northwest line and 150 feet from the northeast line of the Valentine Bennett Survey, nine miles south and two miles west of Seguin, three and one-half miles southwest of the Seligman well.

The Darst Oil Company of Seguin has located its Hamilton 1, 150 feet from the southwest and 1295 feet from the northwest line of a 40-acre lease in the J. H. Williamson Survey. It is one-fourth mile east of the Tidal Oil Company's Seligman.

In the Camp sector of the Darst Creek field, Guadalupe County, Humble Oil & Refining Company has made a location for its Sue E. Denman 4-C, located 600 feet northwest of 3-C. The well is in the William Arrington Survey.

The only other active test in the county is the Luling Oil & Gas Company's J. D. Brown 1, C. Hall Survey, near Kingsville, drilling around 2000 feet.

Two Failures Further Define Productive Area of Pettus Field

San Antonio, Texas.—A couple of failures, further defining the producing area, featured Pettus field activity this week. Houston Oil Company's J. F. Portis 4, A. Smalley Survey, about 500 feet east of Portis 3, has been abandoned below 4200 feet. This well tested salt water at 3916, regular producing horizon. Portis 2 and 3, west of this well, were producers. Portis 1, east of the Portis 3, also was a salt water well.

J. M. Davis et al's G. A. Ray 1, J. W. Williamson Survey, 1000 feet southwest of the Damac discovery well was abandoned at 4148 feet after testing salt water at 3963 feet.

The two wells apparently enclose a small sector of the eastern Damac area, while discoveries in the western portion of the pool indicate prolific production in that direction. This was further indicated by the T. B. Slick Estate's G. A. Ray 5, G. A. Kerr Survey, which is an east offset to the Ray 3. The well made a small producer at 3886-91 feet, but the liner has since been pulled and the test is being reworked. It seems to be in the northeast portion of the west producing area, and possibly defines that area in a northeasterly direction.

Houston Oil's Saxet Field Test Showing for Producer at 4359 Feet

San Antonio, Texas. — Houston Oil Company's E. McGregor 1, Survey 311, Nueces County, Saxet field, is showing for a producer at 4359-65 feet. At this level, it showed 90 feet of mud and 45 feet of oil on a drill stem test. Casing has been ordered and will be set immediately.

Saxet Oil Company's Dunn 6, deep test in the field, is drilling at 6075 feet after testing salt water at that level.

Three more tests are being started. Rutherford Drilling Company's Turner 1 is preparing to spud in. Gulf Coast Oil Company's Perkins—Lagasse 1, H. B. Shepherd Survey, Section 26, and Kepley et al's Speer and Hocker 1, Speer and Driscoll land, are rigging up.

Work Hindered by Cold Weather In Victoria District Is Resumed

San Antonio, Texas.—Cold weather has hindered activity in the Victoria district, but T. B. Slick Estate's McFadden 1 in the J. Varin Survey, in the northeastern end of McFaddin field, is spudding and The Texas Company is starting up on its A. M. McFadden 4, J. M. Rine Survey, also in that field.

Houston Oil Company's McFaddin 1, near the Konrad 1, Telferner field, Victoria County, is building a derrick. C. B. Bunte and C. R. & M. Drilling Company's Keeran 2, Martin de Leon Grant, Keeran field ,is preparing to rig up.

Gulf Coast Field Developments

JACK LOGAN, ***Staff Representative, Houston, Texas***

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Production at Manvel Extended By Completion of Second Well

Houston.—The Texas Company's Belcher 2, first well to be drilled in Manvel field of Brazoria County, Texas, since completion of Belcher 1 as the discovery well late in 1931, was brought in last week for an initial production estimated at five million cubic feet of gas and 43 barrels of 39.2 gravity oil. The completion depth of the discovery well was 5484 feet, while that of Belcher 2, located 1000 feet southeast of the former, was 5602 feet.

The initial production figure of 43 barrels represented the total spray oil for the first 12 hours the well was on production. During the next 24-hour period, the flow amounted to 91 barrels through a quarter-inch choke, with pressures reading 1760 and 1600 pounds respectively. Temperature of the oil was 104 degrees Fahrenheit. The oil was cutting 6.9 per cent basic sediment, with no water observed.

Belcher 2, which is expected to increase its production of oil after ridding itself of flush conditions, set 52 feet of seven-inch strainer and 75 feet of seven-inch blank, and sealed off with a packer at 5475 feet. The well came in at 6:30 p.m. March 9 through three-inch tubing, showing a pressure at that time of 1750 pounds.

By way of comparison, completion data on Belcher 1 are interesting. The discovery well originally was brought in from 5481 feet by setting 18 feet of seven-inch, five joints of 6⅝-inch liner and then a full string of 4¾-inch liner to top. The initial yield was estimated at 2000 barrels, with 315 pounds pressure on the one-inch choke on the tubing and 650 pounds on the casing. The well sanded up and production was killed, with the result that three more feet of hole were drilled to bring it back on production.

Standard of Louisiana Drilling Three Wells in Iberville Parish

Houston.—Standard Oil Company of Louisiana is actively attempting to develop production in Iberville Parish with three drilling wells under way; two at Bayou Choctaw dome and one at Bayou Blue dome.

Its Myrtle-Grove-Wilbert 2 at Bayou Choctaw has proceeded to 2300 feet after setting 13⅜-inch casing at 1030 feet, while Gay 2, located in the same field, is drilling near 5000 feet.

Schwing 7, at Bayou Blue has passed the 4000-foot mark after having logged an oil sand at 2544-60 feet which tested salt water.

Shell's Iowa Wells Pass Up Oil Sands to Reach Deeper Horizon

Houston.—Although both the south and the east offset wells to Vacuum Oil Company's Waite 1, discovery oil well of the Iowa district of Calcasieu and Jefferson Davis Parishes, Louisiana, have cored oil sands just below 5000 feet, they will proceed with drilling down to the 6900-foot horizon from which Waite 1 is producing.

According to official information received March 15, Shell Petroleum Corporation's F. Heyd 2, located 450 feet south of Waite 1 and in Calcasieu Parish, had obtained a successful cement job with the 9⅝-inch casing at 5129 feet and was drilling at 5422 feet in shale and lime. This well showed for oil at 4907-16 feet and again at 4997 feet.

Shell Petroleum Corporation's O. A. Fontenot 1, 450 feet east of Waite 1 and in Jefferson Davis Parish, is waiting on cement to set after having cored an oil sand at 5020-40 feet.

Texas Company Due Two Wells At Barbers Hill Field Next Week

Houston.—The Texas Company will complete two wells at Barbers Hill field during the coming week, barring mechanical difficulties. Wilburn 6, a workover, was drilling the plug at 4910 feet preparatory to setting screen on March 14. Wilburn 8 was doing the same thing at 4392 feet after having set 9⅝-inch casing at 4370 feet.

Among other wells due for completion at Barbers Hill during March is Texas Gulf Producing Company's Mary O. Scott 1, on the northeast flank of the dome, which is drilling below 4610 feet in lime streaked with shale.

Pop Oil Company's Leesville Well Coring Ahead in Oil Sand

Houston.—Pop Oil Company's Esponge and Wizer 1, located in the Leesville district of La Fourche Parish, Louisiana, at latest reports was coring around 3725 feet, a depth marking the bottom of about 10 feet of oil sand.

Previously the company had set 6⅝-inch casing at 3700 feet, after an earlier sand at 3640-70 feet had tested salt water. The well is located 170 feet east and 500 feet north of the southwest corner of Lot 5, Section 26-21s-22e.

Gulf Coast Oil Scouts Want National Convention in Houston

Houston.—Delegates of the Houston district of the Gulf Coast Oil Scouts Association will go to Dallas at the close of this week to make a strong bid for the 1932 convention of the National Oil Scouts Association, as a result of action taken by members and guests of the Houston district scouts at a meeting March 11.

George C. Robinson, presiding as chairman at the meeting, announced the delegation would consist of John Boyce, chief scout for Humble Oil & Refining Company; Harry Sample, scout with Magnolia Petroleum Company, and G. C. Francisco, Jr., Houston district land man with Sun Oil Company.

In addition to the above delegates, the Houston branch of the Gulf Coast Oil Scouts Association will be represented of Lloyd McGee, Humble Oil & Refining Company, who is second vice-president of the national organization.

San Antonio and Dallas have been hosts to the convention in previous years, each city having enlisted the aid of Houston district scouts to obtain the necessary number of proxies to gain the privelege of being hosts, and the Houston delegation is expecting reciprocity in this connection at the meeting in Dallas, March 19.

LOUISIANA-ARKANSAS

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Bossier Parish Test Abandoned After Shooting Proves Futile

Shreveport.—Plain Dealing Oil & Gas Company's Nattin 1, SE NW Section 15-22-14, a wildcat in north Bossier Parish, which showed 150 feet of oil in the hole after formation was vainly shot several weeks ago at 2890 feet, was abandoned last week as a dry hole. Four-and-a-half inch casing was cemented at 2882 feet.

Southern Carbon Company's Fee 57, Section 9-20-4e, Morehouse Parish, Monroe gas field, was completed at 2148 feet, gauging 6½ million cubic feet, with 625 pounds rock pressure.

Natural Gas Production Company's Mays 3, Jane Tharpe Survey, Panola County, Texas, (Bethany), gauged 376,000 cubic feet of gas at 3360 feet. The same company has spudded Cadenhead 1, B. C. Jordan Survey, in the same area.

United Production Corporation has spudded another upper Trinity gas test in the same district, Werner 12, B. C. Jordan Survey.

Operators last week continued swabbing salt water and a little oil from Oil News Publishing Company's Pickering 1, G. H. Patterson Survey, a wildcat in Shelby County, East Texas, which showed oil in Nacatosh chalk at 1508 feet.

Deep Test in Zwolle Field Encounters Strong Gas Show

Shreveport, La.—Loring Oil Company encountered a strong gas pressure last week at 4595 feet in its deep test in the Zwolle field in the lower Cretaceous which was logged at 3998 feet, in Bowman-Hicks 18, SW NW Section 15-7-12, and halted drilling while mud was pumped in to hold back the gas. This test had a gas blowout at 4375 feet and later milled out of the casing at 4350 feet, after setting 1875 sacks of cement to hold back a salt water flow from 4300-4330 feet.

This test is eight miles southeast of R. L. Gay, Trustee's Long-Bell Lumber Company A-1, NW NW Section 10-8-13, which recovered a six-foot oolitic lime core with a saturation of light oil from 4766-72 feet in the Glen Rose. The depth was 4772 feet. Gay has now reamed to 4600 feet and should set casing within a few days.

Two Small Wells Completed In Zwolle's Marl and Chalk

Shreveport, La.—Zwolle's marl and chalk producing horizon added two small producers last week, both in the southeast part of the field. Five new locations, all in the same part of the field, were announced. Three of the tests are southeast of production.

March 12, Zwolle had 13 locations, six derricks, eight drilling tests, one reaming, two waiting on six-inch casing to set, seven shut down, and two waiting on standard rig.

The week's completions in Zwolle were Baird and Stone's McNeely 1, Section 14-7-11, flowing 240 barrels of oil daily through two-inch tubing with packer, at 2493 feet, and Crescent Drilling Company's Byrd 2, Section 12-7-11, pumping 35 barrels daily at 2505 feet, after plugging back from 2600 feet.

Efforts to extend production a mile west of the recently opened southwest offshoot of the Zwolle townsite field ended in failure last week. The Texas Company is arranging to abandon Giaque B-1, Section 10-7-13, as a dry hole at 2490 feet in chalk. This is between the West Zwolle (Blue Lake) producing area and the townsite offshoot.

Spring Ridge Wildcat, Sabine Parish, Prepares to Set Casing

Shreveport, La.—Frank Foster, Incorporated's Stevens 1, NE NW NW Section 20-9-11, Sabine Parish, the second test drilled in the newly opened Spring Ridge oil field, three-fourths of a mile southwest of the discovery well, has been killed with baroid last week to set 6⅝-inch casing.

Total depth of the well is 3357 feet. The operators were coming out of the hole with a nine-foot core when a blowout occurred after logging sand. Elevation is 269 feet.

Shreveport Geologists Vote To Affiliate With A.A.P.G.

Shreveport, La.—At the March meeting of the Shreveport Geological Society that body voted to become affiliated with the American Association of Petroleum Geologists under conditions whereby the society continues to have complete jurisdiction of the selection of its own members, none of which shall by virtue of affiliation with the society claim membership in the national association.

R. E. Heithecker, petroleum engineer of the U. S. Bureau of Mines, stationed in Shreveport to prepare a bulletin on the Zwolle oil field, read a paper on "Drilling Prospecting forPotash in New Mexico." The paper described in detail the methods used, especially how the bureau and the United States Geological Survey cooperated in handling the cores. Mention was made of the problem of securing cores where the salts of potash are soluble. A map was used to show the thickness and extent of the potash beds.

Dr. A. F. Crider of Shreveport, former state geologist of Mississippi and now consulting geologist, read a paper on "The Devonian Shore Line in the Mississippi Valley." This paper was illustrated by a map covering the area from Illinois to Louisiana and extending from Alabama westward to Oklahoma. The outcrops of the Devonian beds as well as the other Paleozoic formations were shown.

The paper called attention to the possibility that certain areas in Mississippi and Arkansas constituted the Paleozoic floor on which the Cretaceous sediments were laid down. This was proven by a number of wells, Dr. Crider said, that have been drilled and reached the Paleozoic floor. Attention was called on the map to the outcrop of the St. Paters sandstone in northern Arkansas and southeast Missouri and sandy streaks in the Devonian around the southern part of the Nashville arch.

Dr. Crider also called attention to the outcrop of coal bearing beds in Alabama, with their possible extension under the coastal plain and a similar basin in northwest Arkansas which extends into Oklahoma, and the possibility that these two basins do not connect because of a Paleozoic or pre-Paleozoic ridge along the Mississippi river separating the two basins.

Conrad, Mont.—A location has been spotted and preparations are under way to move in material for the first work to get under way in the South Pondera district. The Bell-Adams Syndicate will drill Venetz 1 on Section 21-37-3w as soon as weather conditions permit.

Call for bids on contract to drill a test on NW NE Section 17-27-4w, on the same 40-acre tract on which its producers are located, has been issued by Teton Corporation. This company will drill two wells on its holdings this year.

GULF

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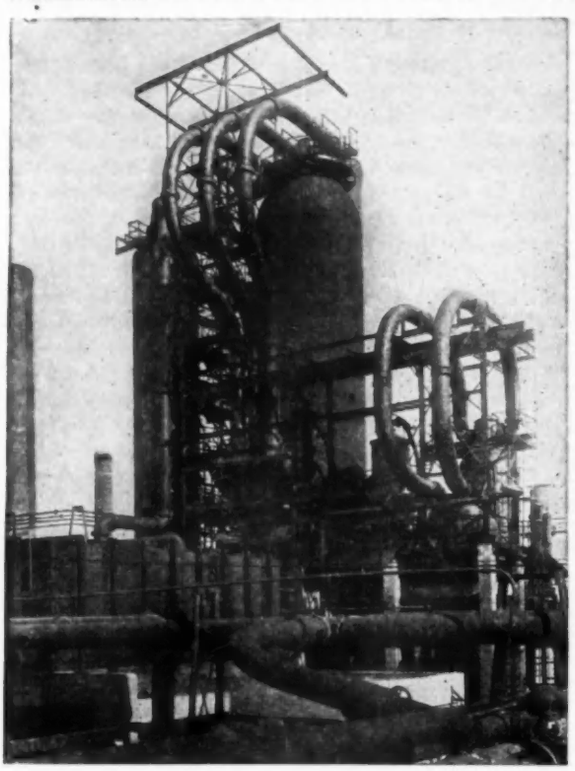

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Completions for Past Week in U. S. Fields

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CALIFORNIA

Company, Well and Location	Initial Production Bbls.	Depth
DOMINGUEZ—		
Shell Oil Co.'s Reyes 101	4400	5340
RINCON—		
General Petroleum Corp.'s Needham 55-2	160	7334

OKLAHOMA

Company, Well and Location	Initial Production Bbls.	Depth
CREEK COUNTY—		
Atlantic Oil Prod. Co.'s Cooper 1 nw c sw 26-14-10e	150	3232
J. A. Allen et al's Robinson 1, nw c se se nw 32-17-11e	¶.025	559
Krasne Drlg. Co.'s Harry 2, se c sw se 4-17-11e	*	1849
McCurry et al's Reed 1, se c nw sw 28-17-11e	*	1857
Gled Oil Co.'s Bible 2, sw c 21-19-9e	*	2343
KAY COUNTY—		
Harris & Haun's Cole 1, c ne se 18-29-1e (owd)	335	3320
W. H. Atkinson & Eason Oil Co.'s Hayes 1, se c ne 24-28-3e	*	3310
MARSHALL COUNTY—		
M. A. Neff et al's Marshall 2, ne c sw nw se 30-5s-6e	27	622
E. L. Harreld & Hudson's Williams 1, sw c se ne 24-7s-5e	*	600
F. H. E. Oil Co.'s Byrd 1, se c ne 8-8s-6e	*	931
C. Dillingham et al's Franklin 1, nw c ne sw 33-6s-7e	*	1147
MUSKOGEE COUNTY—		
Armstrong et al's Morrison 9 (owd) c sw sw 15-14-16e	15	1536
B. W. Christian et al's Morrison 1, c sw nw 15-15-17e	*	2280
OKFUSKEE COUNTY—		
Okla. Crude Oil Co.'s Rogers 1, se c ne sw 8-12-7e	*	2805
OKLAHOMA COUNTY—		
Western Bond & Share Co.'s Durham 1, sw c nw nw 2-11-3w	*	5269
OKMULGEE COUNTY—		
M. H. Castleman's Thomas 5, sw c se 23-15-15e	40	963
LeBeene Drlg. Co.'s Tunnely 3, ne c sw se 32-12-12e	*	2510
Iron Mountain Oil Co.'s Aultman 12, cwl se ne 24-13-14e	*	1303
PAYNE COUNTY—		
Willis O&G's Smith 1, nw c se 10-18-5e	*	3530
PONTOTOC COUNTY—		
Ada Development Co.'s Lloyd 6, se c ne nw ne 6-3n-7e	20	1198
SEMINOLE COUNTY—		
Gypsy Oil Co.'s Coker 7, nw sw sw 2-8-5e	125	4160
STEPHENS COUNTY—		
Dameron & Branch's Dameron 1, se sw ne 11-3s-6w	¶2	365
Geo. Pace et al's Allen 3, nw c se se ne 3-2s-8w	¶2¾	1442
J. C. Chambers et al's Dare 1, nw se se 2-2s-8w	10	¶5 1415
TULSA COUNTY—		
Norfolk Oil Co.'s Tiger 1, nw c ne nw 19-16-14e	*	2105
West Petroleum Co.'s Edwards 10, ne c sw sw 1-18-12e	*	2668
Dunn et al's Flippen 1, ne c sw se 28-18-14e	*	1585
Chastain Oil Co.'s Barnett 1, ne c se ne se 13-18-14e	*	1323
WAGONER COUNTY—		
W. J. Metzger's Wilson 6, sw c nw 30-17-17e	5	1322
Sands Petroleum Co.'s Robin 1, sw c se sw 23-18-15e	¶3	1033

For Tabulation and Comparison See Market Section

KANSAS

Company, Well and Location	Initial Production Bbls.	Depth
COFFEY COUNTY—		
Hegberg's Krost 1, se sw se 30-22-14e	*	1815
GREENWOOD COUNTY—		
Harwood Oil Co. et al's Carson 1, nw nw ne 33-23-11e	225	1973
HARVEY COUNTY—		
Imo O&G's Lehman 1, ne ne se 35-22-2w	150	2957
MARION COUNTY—		
Bednour et al's Bernhardt 1, sw c ne 16-17-4e	*	2660
McPHERSON COUNTY—		
Lario O&G and Shell's Law 1, ne c 24-19-2w	845	3425
MORRIS COUNTY—		
Loomis et al's Lowery 1, nw nw ne 22-16-7e	¶1	443
SEDGWICK COUNTY—		
Continental Oil Co.'s Brown 1, nw nw sw 15-25-1e	80	2614

EASTERN STATES

WEST VIRGINIA

Company, Well and Location	Initial Production Bbls.	Depth
CALHOUN COUNTY—		
Poling & Mollahan, Little 1	¶1¾	2014
LINCOLN COUNTY—		
Hamlin Natural Gas Co., Adkins 8	¶¾	2128
Woodall Gas Co., Honaker 2	¶¾	2436
United Fuel Gas Co., Courtesy Land Co. 8	¶¾	2363
MINGO COUNTY—		
W. H. Norton Trustee, Spaulding 4	8	1060
PLEASANTS COUNTY—		
Dye Farm Oil Co., Dye 1	2	....
RITCHIE COUNTY—		
Lewis Drilling Co., Sandy 1	¶¾	....
WETZEL COUNTY—		
United Pipe Supply Co., Wyatt 1	10	....

SOUTHEASTERN OHIO

Company, Well and Location	Initial Production Bbls.	Depth
MORGAN COUNTY—		
Fike & Co., Russell 17	*	300
WASHINGTON COUNTY—		
Wingetts Run Oil & Gas Co., Thomas 1	¶½	1363
F. L. Johnson & Co., Crago 4	100	3300

CENTRAL OHIO

Company, Well and Location	Initial Production Bbls.	Depth
ASHLAND COUNTY—		
Harmon & George, Horn 6	*	552
FAIRFIELD COUNTY—		
City Natural Gas Works Brucker 3	*	755
GUERNSEY COUNTY—		
C. C. Wharton, Taylor 2	*	835
LORAIN COUNTY—		
Ramage & Willis, Armbruster 2	*	2786
STARK COUNTY—		
Fulton Oil & Gas Co., Rudy 3	¶6	4183
F. A. Brendall & Co., Yearkey 1	¶1	4278

NORTHWESTERN OHIO

Company, Well and Location	Initial Production Bbls.	Depth
HARDIN COUNTY—		
Commonwealth Gas Corp., Kritzler 3	¶¼ & 50	...
LOGAN COUNTY—		
Ennis Bros. & Co., Harpest 1	*	1920
SENECA COUNTY—		
J. H. Murphy & Sons, Getuldig 3	100	....
WYANDOT COUNTY—		
McPheron, Miller & Cook, Wonder 4	2	1448

INDIANA

Company, Well and Location	Initial Production Bbls.	Depth
PIKE COUNTY—		
C. C. Taliaferro Jr., George 6	¶1	....

KENTUCKY

Company, Well and Location	Initial Production Bbls.	Depth
BRECKENRIDGE COUNTY—		
Imperial Oil & Gas Products Co., Bunch 2	12	....
Jones 2	15	....
HENDERSON COUNTY—		
Imperial Oil & Gas Products Co., A. Freeman 2	20	....
S. A. Freeman 2	20	....
HART COUNTY—		
Hupp, Duff & Co., Jaggers No. 1 tr. 13	100	....
HANCOCK COUNTY—		
D. T. Bolling, Bolling 2	6	....
DAVIESS COUNTY—		
MacDonald & Co., Morrison 1	¶¾	....
WEBSTER COUNTY—		
Iley Browning, Liggett 1	¶1	....
McLEAN COUNTY—		
The Ohio Oil Co., Lynn 1	*	1554
Cameron, Thompson & Co., Hardin Hrs. 1	*	....

MICHIGAN

Company, Well and Location	Initial Production Bbls.	Depth
MIDLAND COUNTY—		
The Pure Oil Co., Barnard B-2	1400	....

NORTH LOUISIANA

Company, Well and Location	Initial Production Bbls.	Depth
MOREHOUSE PARISH (Monroe)—		
Southern Carbon Co., Fee 1, 9-20-4e	¶6½	2148
SABINE PARISH (Zwolle)—		
Baird & Stone, McNeely 1, 14-7-11	240	2493
Crescent Drilling Co., Byrd 2, 12-7-11	35	2505

MISSISSIPPI

Company, Well and Location	Initial Production Bbls.	Depth
RANKIN COUNTY (Jackson)—		
Henslee et al, Tanner 1, 14-5-1e	¶43	2403

SOUTH TEXAS

Company, Well and Location	Initial Production Bbls.	Depth
ARANSAS COUNTY—		
Big Lake Oil Co., Giesecke 1	*	....
BEE COUNTY—		
J. M. Davis, Ray 1	*	4148
Houston Oil Co., Portis 4	*	4215
BEXAR COUNTY—		
Chiquita Oil Co., Kosub 1	15	1595
DUVAL COUNTY—		
S. R. C. Oil Corp., Duval Ranch 7	300	1745
Thomas & Tarver, Bishop 6	500	2385
GUADALUPE COUNTY—		
Barnhill et al, Hoffman 1	*	685
STARR COUNTY—		
Hooks & Weaver, K. Bass 4	25	449
J. A. Tarver, A. K. Bass 1	25	473
ZAPATA COUNTY—		
O. W. Killam, Medina 4	200	1464
Trevino Oil Corp., M. Trevino 1-B	20	1251
Winch & Billings, Bustamante 9	200	1528
DeWITT COUNTY—		
Cr. & M. Dr. Co., J. C. Tom 1	*	4513
DUVAL COUNTY—		
Duval Oil Corp., Bishop 8	330	2386
O. W. Killam, Sutherland 1	*	3028
Mag. Pet. Co., Duval Ranch 1	*	2450
GOLIAD COUNTY—		
Plymouth Oil Co., Parks 1	*	4555
GUADALUPE COUNTY—		
Humble O&R Co., Sue Denman 3-c	365	2555
JIM HOGG COUNTY—		
United N&S Oil Co., Gutierrez 1	*	1950
MEDINA COUNTY—		
C. J. Webster O&G Co., Adams 1	*	3078
STARR COUNTY—		
H. H. Davis, K. Bass 2	15	485
Los Olmos O&G Co., K. Bass 9 (10)	20	340
ZAPATA COUNTY—		
K&M Oil Co., I. Cuellar 1	¶40	1508
S.R.&C. Oil Co., Montemayor 8-D	*	1850

TEXAS GULF COAST

Company, Well and Location	Initial Production Bbls.	Depth
HULL FIELD—		
W. B. Flynn, Ray 2 (wo)	100	2230
MANVEL FIELD—		
The Texas Co., Belcher 2	¶5	5602
PIERCE JUNCTION FIELD—		
Gulf Prod. Co., Cain 9	500	4000
TRINITY COUNTY—		
Mound Prairie Oil Co., Wm. Cameron Lbr. Co. 1	*	4500

CENTRAL EAST TEXAS

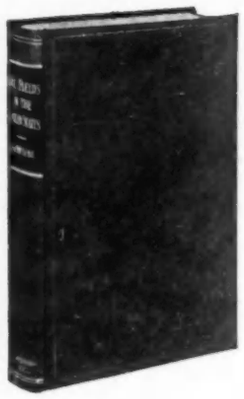
Company, Well and Location	Initial Production Bbls.	Depth
JOINER AREA—		
Ajo Oil Corp. (was Carl G. Wiley), S. E. Sanders (55-ac) 3	8000	3701
J. F. Carbtree-Foster-Jenkins, Giles 2	2000	3712
East Texas Ref. Co., Grissom (184½-ac) 4	7500	3675
Golding-Murchison Oil Co., E. L. Pinkston (84-ac) 2-C	6500	3714
Graham Bros. et al, Church Lot 1	5500	3756
Grayburg Oil Co., Kangerga (40-ac) 5	9500	3691
Gulf Prod. Co., Ida Holt 7-B	9000	3813
H. Johnson (101-ac) 2	7000	3762
Humble O&R Co., Ida Holt (99-ac) 3-C	8600	3787
Chas. Pilgreen (56-ac) 3	10,000	3802
R. E. L. Silvey (209-ac) 2-B	10,500	3694
Lion Oil Ref. Co., H. Brooks (174-ac) 6-B	2000	3724
Mid-Kansas O&G Co., M. C. DeGuerin (158-ac) 3	10,000	3643
H. C. Burton 1	11,000	3642
Prairie O&G Co., J. B. Wilson (71-ac) 6	9500	3634
Sayre Oil Co., Samp Stone (31-ac) 4	6500	3662
Sinclair O&G Co., Mayfield (149-ac) 6-B	7000	3635
A. S. Jarvis, (266-ac) 10-A	13,000	3703
Sun Oil Co., Mrs. A. Barksdale (34¾-ac) 3	12,000	3811
O. W. Knight (264-ac) 9	8500	3680
S. A. Selman (67-ac) 4	8500	3680
Stanolind O&G Co.-Pure Oil Co., Siler (949.6-ac) 1	10,000	3612
Texas Jersey Oil Corp., W. P. Keeling (6-ac) 2-B	9000	3761
Graddy H. Vaughn et al, E. W. Reagan (26.36-ac) 3	10,000	3747
KILGORE AREA—		
Arkansas Fuel Oil Co., G. Donelson (40-ac) 2	9500	3600
Byrd & Frost, Inc., J. B. Watson (22-ac) 1-A	9200	3607
John Droppleman et al, Lulu Martin 1	8500	3709
Gulf Prod. Co., C. E. Christian (100-ac) 4-A	7000	3645
A. A. King (55-ac) 2	1000	3568
R. H. Still (189-ac) 1	8000	3569
Humble O&R Co., T. Barton (50-ac) 1	4000	3740
K. & P. Oil Co., M. Brock (12-ac) 3	7500	3657
Ed. Lacey-John Koberg et al, G. H. Blackman (12-ac) 1	8000	3701
Magnolia Pet. Co., M. E. Peterson 3	11,000	3654
McCulloch Co., Geo. Strong (2-ac) 1	12,000	3718
W. M. Pollock-Jas. B. Hughes et al, A. A. King (9-ac) 1	15,000	3713
Producers Investment Corp., J. A. Butts (11¼-ac) 3	11,000	3602
Republic Prod. Co.,-H. E. Oliver & Brown, Hindman (23.57-ac) 3	9000	3645
Shell Pet. Corp., W. W. Elder (157-ac) 11	10,000	3621
B. F. Laird (211-ac) 1	8500	3543
E. W. Willoughby (57-ac) 5	9000	3574
The Texas Co., R. B. Walls (104-ac) 2	10,500	3659
Tidal Oil Co., M. B. Hughey-Rose 3	12,000	3490
Whittle & Kavanaugh's 4th Co., Ross Brown (32-ac) 2	10,000	3583
LONGVIEW AREA—		
Fred J. Adams, Jr., et al, School Lot 1	9600	3595
Amanda Oil Co. (W. D. Ambrose), D. F. Magrill (45-ac) 3	9000	3652
Amerada Pet. Corp., J. M. Tuttle (48-ac) 3	15,000	3549
M. Killingsworth (100-ac) 4	11,000	3573
Arkansas Fuel Oil Co., Thad Snoddy (51-ac) 2	10,000	3580
Atlantic Oil Prod. Co., W. P. Duncan (154.7-ac) 4	14,000	3679
W. H. Moyers (128-ac) 8	12,000	3630
J. M. Tuttle (16.77-ac) 3-A	13,000	3575
Atlantic & Pacific Oil Co., Ed. Harvey (Blk. 30) 1	7500	3670
Barnsdall Oil Co., M. Adams (102½-ac) 7	9600	3672
J. G. Beard et al, W. L. Fuller (67-ac) 1	15,000	3703
Canadian Oil Producing Co., J. A. Whittaker (7½-ac) 2	11,500	3500
Cherokee Chief Oil Co., D. Johnson (11.23-ac) 2	7000	3670
Columbia O&G Co., J. B. Doby (42-ac) 3-A	8500	3591
J. G. McGrede (41-ac) 3	7000	3675
Devonian Oil Co., L. C. Ingram (80-ac) 2	9500	3563
Dillard Oil Co., W. E. Jones (50-ac) 6	10,000	3662
Empire Gas & Fuel Co., A. Green (67-ac) 2	11,000	3650
Ralph Fenton & Lonnie Glasscock, H. Alexander (5-ac) 1	10,000	3561
J. C. Falvey et al, Doby-Rodden (20-ac) 1	8500	3774
F-H-E Oil Co.-Flemming & Kimbell, Flemister (37-ac) 5	10,500	3625
Glasscock Bros. et al, East Mountain Church 1	5500	3759
Gulf Prod. Co., Lacy-Snyder (75-ac) 4	14,000	3503
Humble O&R Co., J. F. Boles (100-ac) 4	9500	3641
J. K. Edwards (200-ac) 11	8000	3621
J. K. Edwards (200-ac) 13	3000	3684
W. R. Hughes (185-ac) 6	7800	3693
E. W. Smith (50-ac) 2	2500	3638
Imperator Oil Corp. (was Buchanan), Geo. Richey 1	7000	3628
Imperial Pet. Co., (was H. S. Moss), W. C. Shoults (21-ac) 2	11,000	3713
J. H. Massie et al, J. W. Orr (36¼-ac) 2	12,000	3674
Pilot Oil Co., Mattox 1	8000	3623
Rajo Oil Corp., J. C. Barnett-Shell (80-ac) 1	3500	3666
Rancho Oil Co., (was Fleetborn Oil Co.) Edwards (106-ac) 4	10,500	3680
Roeser-Pendleton, Inc., W. R. Nicholson (94-ac) 1-A	7500	3672
Roeser-Pendleton & J. K. Wadley, D. D. Sheffield (50-ac) 4	9500	3644
Satellite Oil Co., L. M. Colburn (35-ac) 4	9500	3567
Shell Pet. Corp., J. W. Akin (100-ac) 3	11,000	3638
W. L. Brawley (33-ac) 2	10,000	3716
C. C. Landers (206-ac) 10	8500	3673
G. W. Richey (61-ac) 6	12,000	3605
C. F. Smith et al, Geo. Jones (50-ac) 1	10,500	3575
E. L. Smith Oil Co., J. W. Harrison-Magrill (15-ac) 1	12,000	3547
J. R. Smith Properties, Inc., J. B. Doby (20-ac) 3	9600	3514
W. F. Sorrels & Owens, A. N. Brawley (16-ac) 1	500	3753
Stanolind O&G Co.-Simms Oil Co., A. J. Tuttle (95-ac) 3	8800	3575
Steen Drlg. Co. & Meadors, J. F. Phillips-Shell (96-ac) 2	1000	3685
Sun Oil Co., M. C. Satterwhite (82.7-ac) 5	10,000	3601
Tidal Oil Co., Arch Davis (130-ac) 3	15,000	3582
Yount-Lee Oil Co., Adrian-McCrary (65-ac) 3	9500	3531
L. E. Orms (55½-ac) 5	10,000	3555
Pat Hopkins (100-ac) 3	9600	3527
VAN FIELD—		
Humble O&R Co., A. J. Fowler (95-ac) 5	8500	2836

EAST TEXAS

Company, Well and Location	Initial Production Bbls.	Depth
PANOLA COUNTY (Bethany)—		
Natural Gas Prod. Co., Mayes 3, Jane Thorpe sur	¶½	3360

NEW MEXICO

Company, Well and Location	Initial Production Bbls.	Depth
EDDY COUNTY—		
Flynn-Welch & Yates, State 61	40	2034
HOBBS FIELD—		
Midwest Ref. Co., E. H. Byers (NW¼ Sec. 3-19s-38e) 8	¶2-2200	4178



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Permits Granted for New Wells

▼ ▼ ▼

CALIFORNIA

DOMINGUEZ—Union Oil Co., Callender 29, 33-3-13.

FRUITVALE—Mohawk Pet. Co., No. 9, 21-29-27. Western Gulf Oil Co., Carpenter 1, 21-29-27; Rea 1, 21-29-27; ,11-KCL-B 22-29-27. Plymouth Oil Co., Fruitvale 2, 23-29-27.

LOS ANGELES COUNTY—Walter I. Barcus, Lupie 1, 28-4-13.

MT. POSO—A. S. Mayes, No. 1, 36-27-28. Hoke Woodward, No. 1, 4-27-28.

SAN DIEGO COUNTY — C. H. Shannon, Mack 1, 14-15-3.

LOUISIANA

IBERIA PARISH—Jefferson Lake Oil Co., Inc., New Orleans, Lake Peigneur 29, 12s-5e, 150 ft n 45° 50 ft w of well 28 in Lake Peigneur.

SABINE PARISH—E. F. Neely, Shreveport, Clanon 2, 14-7n-11w, 500 ft n and 100 ft w of se cor se¼ nw¼. Reid & Stone, Shreveport, Guaeyheagen 1, 11-7n-11w, 500 ft n and 500 ft w of se cor sw¼ se¼.

ST. LANDRY PARISH — The Texas Co., Shreveport, Botany Bay Fee 11, 4-16s-5e, beginning at most southerly ne cor of T. T. Co., Botany Bay tract run n 82° 10 ft w 474 ft, thence n 7° 50 ft e 105 ft to location.

TERREBONNE PARISH—The Texas Co., Shreveport, State Lake Pelto 5, 8-23s-18e, 1500 ft n and 1500 ft w of se cor of sec.

TEXAS

ARCHER COUNTY — Fain-McGaha Oil Corp., Wichita Falls, B. T. McCarty, 100, 1, S 20, R. Chisholm sur, 150 ft e of center of w line. C. E. Jones et al, Iowa Park, J. C. Thomas, 10, 1, B 54, DCSL sur. L. T. Burns, Wichita Falls, W. J. Logan, 80, 1, No. 23 J. M. Taylor sur, 150 ft from s and e lines. Petroleum Prod. Co., Wichita Falls, J. T. Richardson, B, 13, 1, B 21, Hart sur, 150 ft from n and 175 ft from e line. C. E. Fritz, Olney, W. J. Logan, 100, 1, B 25, J. Taylor sur, 275 ft from n and 150 ft from w line. Gilliland & Rosser, Wichita Falls, J. S. Walsh, 56, 1, 2417 TE&L sur, 150 ft from w and 450 ft from s line. Dr. C. W. Wallace, Wichita Falls, Fee, 167, 20, S 1, S. P. Ry. sur, 349 ft s of No. 12.

AUSTIN COUNTY—H. S. Grant, Hempstead, M. E. Chesley, 26, 1, W. C. White sur, 150 ft from s and w lines.

BAYLOR COUNTY—Consolidated Oil Co., Wichita Falls, W. H. Portwood, 80, 20, 1281 TE&L sur, 450 ft from e and 150 ft from s line.

BROWN COUNTY—E. T. Green, Brownwood, G. W. Richey, 40, 1, S 11, HT&B sur, 625 ft from n and 175 ft from w line. Bishop & King, Brownwood, Shelton, 85, 10, S. H. Batton sur, 630 ft from n and 150 ft from e line. L. L. Shead et al, Brownwood, W. F. Curry, 120, 1, J. A. Wright No. 632 sur, 1480 ft from w and 325 ft from s line. T. Z. VanBebber, Brownwood, L. W. McDonald, 44, 1, No. 60 C. J. Carrier sur, east central part of lease. Y. C. Oil & Gas Co., Brownwood, J. C. Jones, 346, 1, S 19, H. Kaber sur, 200 ft from n and w lines.

CASS COUNTY—Wm. S. King, Atlanta, T. R. Richey, 121, 1, L. Mornen sur, 700 ft from w and 195 ft from s line.

COOKE COUNTY—D. L. Monroe, Gainesville, J. Pantler, 40, 1, L. Mikel sur, 150 ft from s and e lines.

COKE COUNTY — Mid-Kansas Oil & Gas Co., Tulsa, Okla., C. J. Henry, 160, 1, S 271, B 1A, H&TC sur, 990 ft from se and sw li of sw¼.

COLEMAN COUNTY—Barnsdall Oil Co., Tulsa, Okla., F. Golson, 82, 3, I. Harris sur, 1350 ft from s and 150 ft from w line.

DENTON COUNTY — Roanoke Dev. Co., Dallas, L. Litsey, 320, 1, F. Hurton sur, 525 ft from e and 150 ft from s line.

DUVAL COUNTY—Jno. F. Camp, San Antonio, A. Weil, 1, S 570, 150 ft from sw and 990 ft from se line.

For Tabulation and Comparison See Market Section

FALLS COUNTY—O. B. Perot, Waco, J. C. Gorman, 65, 1, B 15, I. Golinda sur, 300 ft from n and 500 ft from w line. Hodges & Marr, Corsicana, G. London, 10, 1, P. Zarza sur, 207 ft from n and 150 ft from w line.

GREGG COUNTY—Rowan & Nichols Oil Co., Dallas, B. C. Todd, 28, 2A, W. H. Castleberry sur, 332 ft from n and 520 ft from w line. Shasta Oil Co., Longview, T. D. Campbell, A, 56, 3, D. Ferguson sur, 660 ft s of No. 2. Paul Doran, Longview, Samples, 50, 2, J. Taylor sur, 330 ft from s and e lines. O. G. Murphy, Eldorado, Ark., J. B. Doby, 45, 4, W. H. Castleberry sur, 157 ft from w and 200 ft from s line. Redgrave & Fagan, Tyler, A. Wynn, 5, 1, W. P. Chisum sur, 160 ft from s and e lines. J. B. Dunnigan, Kilgore, S. L. Dansby, 39, 1, W. P. Chisum sur, 282 ft from s and 330 ft from e line. Barnsdall Oil Co., Tulsa, Okla., R. E. L. Ferguson, 37, 4, H. R. Hokit sur, 280 ft from w and 200 ft from s line. Fain-McGaha Oil Corp., Wichita Falls, W. A. Bouknight, 53, 4, H. H. Edwards sur, 330 ft from n and w lines. Atlantic Oil Prod. Co., Dallas, M. Turner, 161, 3, W. C. Wakeland sur, 330 ft from n and w lines; S. G. Andrews, A, 110, 5, W. F. Hyde sur, 950 ft from s and 1335 ft from e line; 6, 950 ft from s and 660 ft from e line; A. Tooke, A, 40, 1, W. C. Wakeland sur, 330 ft from n and w lines; W. P. Duncan, 155, 7, D. Ferguson sur, 409 ft from n and 330 ft from e line; J. Bander, 84, 3, D. Ferguson sur, 330 ft from s and w lines; N. Turner, 162, 4, W. C. Wakeland sur, 770 ft n of No. 2; 3, 660 ft n of No. 4. Arkansas Fuel Oil Co., Shreveport, La., Hughey-Ross, 220, 5, J. Maffitt sur, 457 ft from n and 990 ft from w line. Selby Oil & Gas Co., Tulsa, Okla., Snavely, C, 118, 3, J. R. Crosby sur, 330 ft from n and 1550 ft from e line; 2, 330 ft from n and 2210 ft from e line. Stanolind Oil & Gas Co., Longview, Cox & Hamon, 72, 4, Wm. Castleberry sur, 400 ft from e and 1630 ft from s line; Wm. Clayton, 50, 3, L. B. Outlaw sur, 1345 ft from e and 352 ft from s line; M. B. Hughey, C, 41, 4, G. W. Hooper sur, 330 ft from s and e lines. Gulf Prod. Co., Houston, A. Nichols, 50, 1, D. Dainwood sur, 330 ft from n and w lines. Simms Oil Co., Dallas, J. J. Flewellen, B, 374, 5, M. Mann sur, 1144 ft from e and 330 ft from s line. Roeser & Pendleton Inc., Fort Worth W. K. Nicholson, 94, A2, M. Mann sur, 330 ft from e and 1000 ft from s line. W. R. Nicholson, B, 75, B1, M. Mann sur, 358 ft from w and 353 ft from s line. Sun Oil Co., Dallas, C. Brown, 100, 2, Wm. McCurry sur, 375 ft from w and 330 ft from s line. Magnolia Pet. Co., Dallas, M. B. Hughey, 80, 1, Wm. McCurry sur, 660 ft n of No. 3.

GUADALUPE COUNTY — Darst Oil Co., Seguin, W. Hamilton, 48, 1, H. J. Williamson sur, 1295 ft from nw and 150 ft from sw line. W. J. Walton, Seguin, S. Bloch, 50, 1, V. Bennett sur, 1230 ft from n and 150 ft from e line.

HARRIS COUNTY—Wilson Oil Co., Houston, Wheeler-Pickens, 2, 8, B 25, J. B. Stevenson sur, center of lot 26. Moody Corp., Houston, Herman, 25, 1, J. Kopman sur, 200 ft w of center of e line. Sun Oil Co., Dallas, R. L. Blaffer, 292, 50, R. Dunman sur, 102 ft from e and 315 ft from s line.

HARRISON COUNTY — T. B. Medders, Longview, T. W. Davidson, 65, 1, R. Starr sur, 225 ft from n and w lines.

HARDIN COUNTY — Rio Bravo Oil Co., Houston, Fee, 158, C130A, J. F. Sotton sur, 130 ft n and 150 ft e of No. 117A; C131A, 120 ft n and 180 ft e of No. 126A.

HOWARD COUNTY—F. H. E. Oil Co., Fort Worth, L. C. Denman, 80, 1, S 14, B 30, T&P sur, 330 ft from n and w lines.

HUTCHINSON COUNTY — Dixon Creek Oil Co., Amarillo, Chetham, 80, 7, S 38, B Y, A&B sur, 330 ft from s and 990 ft from e line; 6, 330 ft from s and 990 ft from w line. C. J. Oates, Stinnett, M. A. Starnes, 40, 1, S 24BM-23 T. C. Ry. sur, 410 ft from e and 375 ft from s line.

IRION COUNTY—Apollo Oil Co., San Angelo, J. M. Nutt, 100, 4, S 6, G.C.S.L. sur, 500 ft from n and 550 ft from w line.

JEFFERSON COUNTY — M. P. Baldwin, Fort Worth, O. M. Todd, 406, 1, Wm. Carr sur, 200 vs. from n and 58 vs. from w line. Jack Schmidt, Fort Worth, M. C. Todd, 713, 1, Wm. Carr sur, 600 ft from n and 160 ft from w line.

LIBERTY COUNTY—Cranfill & Reynolds, Houston, N. Esperson, 20, C. W. Fisher sur, 510 ft n of No. 5. Humble Oil & Refg. Co., Houston, R. S. Sterling, 1041, 9, Jas. McFaddin sur, 300 ft w of No. 1.

MATAGORDA COUNTY — P. S. Griffith, Houston, L. A. Baer, 1100, 2, S. Ingram sur, 600 ft from w and 4000 ft from s line. H. S. Smith, Inc., Houston, T. E. Hudson, 40, 1, B 15, H. Parker sur, 850 ft from e and 1000 ft from s line.

McLENNAN COUNTY—Elm Oil Co., Tulsa, Okla., C. S. Lankhart, 300, 1, I. Galindo sur, 200 ft from e and 570 ft from s line.

McMULLEN COUNTY—V. G. Schimmel et al, San Antonio, F. H. Hale, 2, S 63, Two Rivers sur, 2000 ft from n and 1450 ft from w line of sec.

NUECES COUNTY—Jas. K. Kepley, Laredo, C. D. Sevier, 100, 1, Por 582-583-311, 200 ft from s and e lines.

PALO PINTO COUNTY — Brazos River Gas Co., Mineral Wells, L. E. Slay, 206, 2, R. Clark sur, 1200 ft from nw and 330 ft from ne line; 1, 600 ft from nw and sw lines.

RUSK COUNTY — Caney Creek Oil Co., Tyler, C. Young, 40, 1, M. J. Pru sur, 330 ft from s and w lines. Black & Stroube, Dallas, Wm. Jernigan, 31, 1, J. C. Snow sur, 330 ft from n and e lines. Kirby Pet. Co., Houston, J. Williams, 65, 3, T. J. Martin sur, 660 ft se of No. 2. Cordova-Union Oil Corp., Fort Worth, C. O. Christian, 36, 1, W. A. Elliott sur, 330 ft from n and e lines. Golding-Murchison Oil Co., Dallas, J. Lee, 45, 2, Geo. Berry sur, 330 ft from s and e lines. G. C. Wood, Tyler, J. B. Irwin, 35, 1, Lindley sur, 254 ft from n and 107 ft from w line. H. C. Maxwell, 111, 4, F. Cordova sur, 150 ft sw of center of ne line. Sinclair Oil & Gas Co., Fort Worth, J. W. Ashby, 54, 1, Wm. Clark sur, 300 ft from s and w lines. Mid-Kansas Oil & Gas Co., Shreveport, La., J. F. Mason, 104, 6, J. B. Cadena sur, 330 ft from n and w lines. Republic Prod. Co., Houston, J. H. Scoggins, 141, 3, W. W. Simms sur, 330 ft from n and 159 ft from e line. Prairie Oil & Gas Co., Ranger, J. B. Wilson, 71, 6, M. J. Pru sur, 399 ft from e and 725 ft from s line. Humble Oil & Refg. Co., Houston, R. E. L. Silvey, 209, B3, T. J. Martin sur, 1848 ft from e and 1539 ft from s line; C, 61, 1, Geo. Berry sur, 330 ft from w and 1095 ft from s line. C. Pilgreen, 70, 4, J. M. Barton sur, 330 ft n of center of s line. W. L. Price, 206, 8, A. Melton sur, 330 ft from n and w lines; 9, 660 ft e of No. 8. Gulf Prod. Co., Houston, C. E. Christian, A, 164, 5, Geo. Cooper sur, 330 ft from e and 417 ft from s line. W. Florence, 165, 8, J. S. Whiteman sur, 330 ft from s and w lines.

SHACKLEFORD COUNTY—A. C. Walker, Albany, L. H. Hill, 40, 2, B 38, Blind Asy. sur, 375 ft nw of No. 1. Callihan & Carter, Dev. Co., Albany, J. P. Clarke, 54, 3, S 2, Blind Asy. sur, 1350 ft from e and 150 ft from s line. Union Oil & Mining Co., Tulsa, Okla., L. C. Huskey, 320, 25A, 548, TE&L sur, 1100 ft from w and 1400 ft from s line. Sedwick & Wylie Bros., Albany, W. P. McNeill, 160, 1, S 59, E. T. Ry. sur, 150 ft from n and 200 ft from e line. Loggie & Arendt Oil Co., Albany, E. E. Whitney, 160, 1A, S 8, S. P. Ry. sur, 1325 ft from w and 750 ft from s line.

SMITH COUNTY — Iowa Payne Oil Co., Marshall, J. B. Wilson, 25, 1, Jas. Jordan sur, 330 ft from s and e lines. Roy I. Carter Drill-

ing Co., Tyler, T. O. Wright, 10, 2, J. Vargas sur, 150 ft from w and 200 ft from s line. Magnolia Pet. Co., Dallas, R. Loosier, 137, 6, J. Vargas sur, 660 ft s of No. 1. Sun Oil Co., Dallas, Mrs. A. V. Ritch, B, 54, 2, J. Vargas sur, 282 ft from e and 2304 ft from s line. A. V. Ritch, A, 99, 2A, J. Vargas sur, 330 ft from n and e lines. H. A. Pace, B, 643, 2B, J. Vargas sur, 330 ft from n and w lines. Sinclair Oil & Gas Co., Fort Worth, R. G. Wright, 108, 7, J. Vargas sur 783 ft from s and 332 ft from w line.

STARR COUNTY—San Marcos Dev. Co., San Marcos, F. Ivey, 207, 1, S 8, Por 75, 1050 ft from n and 450 ft from e line; 2, 450 ft s of No. 1.

UPSHUR COUNTY—Conservative Oil Co., Dallas, O. M. Victory, 100, 4, E. A. J. Evans sur, 330 ft from n and e lines. C. J. Webster Oil & Gas Co., San Antonio, C. V. McClelland, 450, 1, M. P. Torres sur, 385 ft from n and 1000 ft from w line.

VAN ZANDT COUNTY—Pure Oil Co., Fort Worth, J. E. McPherson, 72, 3, Wm. Daniel sur, 308 ft from w and 200 ft from s line. N. E. Clark, 94, 7, J. Prado sur, 600 ft from n and 225 ft from w line. Humble Oil & Refg. Co., Houston, R. S. Blake, 201, 14, J. Walling sur, 250 ft n of center of s line.

VICTORIA COUNTY—Houston Oil Co., Houston, A. M. McFaddin, A1, I.R.R. No. 20 sur, 200 ft from e and 240 ft from s line. C. R. M. Drilling Co., San Antonio, G. Keeran, 2000, 2, M. Leon sur, 1500 ft e of No. 1.

WARD COUNTY—Abell Bros., Midland, F. G. Smith, 320, 1, S 4, B 34, H&TC sur, 330 ft from n and e lines.

WICHITA COUNTY—R. R. Clark et al, Wichita Falls, J. F. Bickley, 400, 15, S 2, C&M sur, 1350 ft from n and 688 ft from e line.

YOUNG COUNTY—J. D. Carpenter, Olney, W. H. Barrett, 10, E. W. Sargent sur, 550 ft s of No. 1. Wooten & Reed, Graham, A. E. Robinson, 125, 3, 1467, TE&L sur, 150 ft from n and w lines. Marshall, Perry & Snoddy, Wichita Falls, W. S. Husted, 80, 1, 241, TE&L sur, 150 ft from n and w lines. W. N. Maer, Wichita Falls, W. S. Husted, 120, 1, 27, TE&L sur, 150 ft from w and 450 ft from s line. F. Fain-McGara Oil Corp., Wichita Falls, Mrs. E. Weems, 120, 1, 626, TE&L sur, 1330 ft from s and 1475 ft from e line. D. M. Ross, Wichita Falls, C. D. Leberman, 80, 1, 271, TE&L sur, 150 ft from n and w lines. P. P. Langford, Jr., Wichita Falls, C. M. Boyd, 80, 1, S 1, BBB&C sur, 1100 ft from n and 300 ft from e line. D. L. Wolf, Olney, Fee, 25, 3, 165, TE&L sur, 300 ft e of No. 2. E. W. Hunt, Olney, Fee, 160, 1, 240, TE&L sur, 883 ft from w and 150 ft from s line. Moran & Wotela Royalty Corp., Wichita Fallas, W. B. Howard, 100, 5, 3401, TE&L sur, 1451 ft from n and 1403 ft from w line.

ZAPATA COUNTY—W. M. Lee, Laredo, I. G. Trevino, 30, 1, S 66, B 7, 150 ft from s and w lines.

ABBREVIATIONS

NOTE—The following is the explanation of abbreviations, signs, etc., used in completion and wildcat reports: *—dry hole, abandoned well; ‡—salt water; †—junked and abandoned; ¶—million feet of gas; abn—abandoned; bbls—barrels; b.s.—basic sediment; cas—casing; co—cleaning out; dk—derrick; dr—drilling; fsh—fishing; ft—feet; in.—inches; lcn—location; m—milling; n, s, e, w—north, south, east, west; r—reaming; sd—shut down; sdtr—side-tracking; sp—spudding; sr—straight reaming; std—standardizing; sw—salt water; td—total depth; ur—underreaming; wo—workover; wosr—waiting on standard rig.

OKLAHOMA

CREEK COUNTY—McCurry et al, Watkins 2, csl ne sw 28-17-11e. Smith and Woods, McNulty 1, se c sw nw 6-18-10e. Holmes Oil Co. et al, Deere 1, se sw se 25-19-9e.

KAY COUNTY — McDaniels et al, Blumbaugh 1, c nw ne 30-25-1e.

MUSKOGEE COUNTY—J. M. Foltz, Island 2, nw c se se nw 8-15-8e.

NOBLE COUNTY — Pepen et al, Yost 1, (owd) nw c ne 22-23-2w.

OKLAHOMA COUNTY—Meyers Drlg. Co., Denham 1, sw c nw nw 2-11-3w. R. A. McArthur et al, Coates 1, se c ne nw 22-11-3w.

PITTSBURG COUNTY—Ruby-Ann Oil Co., George 1, cel nw se 3-4n-16e.

PONTOTOC COUNTY — L. Myers et al, Myers 2, se c 21-5-6e. Smith and Bowles, Miller 1, nw ne sw 27-5-6e. Sun Beam Oil Co., Miller 1, sw ne nw 27-5-6e. Benedum and Trees, Burk 2, nw c 33-5-6e. Bebee Oil Co., Starett 1, se c 29-5-5e.

STEPHENS COUNTY—J. C. Chambers et al, Dare 2, nw c ne se 2-2s-8w. Crane and Rankin, Dare 1, sw nw nw 1-2s-8w.

TILLMAN COUNTY—D. S. Smith, Fee 1, ne c nw nw 6-5n-15w (owd).

WAGONER COUNTY—Sheridan Oil Co., Drew 1, sw c nw ne 26-18-15e.

KANSAS

BUTLER COUNTY—Ramsey et al, Ramsey 1, se c ne 1-24-5e.

DOUGLAS COUNTY — Huett and Lewis, Dodder 1, cnl sw 7-15-18e.

ELLSWORTH COUNTY—Gypsy Oil Co., et al, Stoltenberg 2, nw ne sw 22-16-10w. Aylward et al, Stratman 4, nw ne se 1-17-10w.

GREENWOOD COUNTY—Aikman et al, Povenmire 1, ne c se se 15-22-13e. Harwood Oil Co. et al, Carson 2, ne ne nw 33-23-11e.

HARVEY COUNTY — Joe Liggett et al, Voshell 1, ne c sw 33-23-3w.

McPHERSON COUNTY — Dietrick et al, Sinclair 1, se se sw, 25-19-1w. Vernon O&G Lewis 1, se c sw 26-19-2w.

RENO COUNTY—Olsen Drlg. Co. & Shell, Johnson 1, c sw nw 24-23-4w. Olcen Drlg. & Shell, Roberts 1, c nw nw 25-23-4w. Olsen Drlg. Co. & Shell, Goering 1, c ne sw, 26-23-4w.

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Wildcat Reports from All Sections

CENTRAL EAST TEXAS

Company, Well and Location	Initial Production Bbls.	Depth
CAMP COUNTY—		
Monitor Oil Co., G. L. Merrell (110-ac) 1	*	4530
VAN ZANDT COUNTY—		
Hutcherson-Anderson & L. G. Priest, C. G. Beckham 1	*	5731

EAST TEXAS

HARRISON COUNTY—Ryans Cons. Pet. Corp.'s J. M. Furrh 1, T. J. Copelain sur, rig. Lloyd Oil Corp.'s Timmons 1, Jno. Findley sur, 10-inch 240 ft, sd 4195 ft, lime and anhydrites. Gauchee et al's T. W. Davidson 1, Richard Starr sur, dk pat.

MARION COUNTY—Baunauch Dev. Co.'s Miller 1, Henry Fulgram sur, top Saratoga 2260 ft, top PG 2480 ft, dr 3280 ft lime.

PANOLA COUNTY—United Gas Pub. Serv. Co.'s Cadenhead 1, B. C. Jordan sur, dr 2100 ft; Werner 12, B. C. Jordan sur, sp 15½ cas 150 ft, dr 280 ft. Daisy O&G Co.'s Rucks Hrs. 1, Jno. Palmer sur, sd 3264 ft, shale. Moses & Wallace's C. L. Daniels 1, Isabel Hanks sur, sd 650 ft. Hoffer et al's Cameron 1, W. A. Lagrone sur, dk. Davidson et al's Latham 1, Wm. Rich sur, 10-inch 260 ft, base chalk 2095 ft, sd 2334 ft. Nelson et al's Williams 1, Jas. Hanks sur, 12½ cas 400 ft, sd 3055 ft, shale and lime. Stamps et al's Chadwick 1, Wm. Scantleberry sur, rig.

SABINE COUNTY—Rogers & Johnson's Polley 1, Jno. Horton sur, sd 250 ft.

SHELBY COUNTY—E. L. Chapman's Holt 2, Matthew Moore sur, coring 3180 ft (second hole). McRobie et al's Windham 1, Wm. Leach sur, (296-ac tract), sd while trying pull parted cas, td 3393 ft. Maulding et al's Frost Lbr. Ind. 1, A. B. Fountain sur, sd 3246 ft. H. H. Gracey's J. A. Morrison 1, Wm. English sur, sd 2600 ft. C. H. Tautenhahn's J. C. Bogard 1, Thos. Baker sur, sd 20 ft, partly rigged up. Ridgeway et al's Polley 1, Domingo Gonzales sur, 10-inch 112 ft, sd wo cas 822 ft. K. H. Francis' Jno. Mims 1, Mary Smith sur, AC 3330-77 ft, fsh ds, td 3382 ft. Oil News Pub. Co.'s (Simpson & Lewis), Pickering 1, G. H. Patterson sur, (361-ac tract), swabbing sw show oil, td 1508 ft. Ray & Dunbar's Hayden 1, D. F. T. Yordt sur, (153 ac tract), rig. Fuller & O'Brien Bros.' Frost-Johnson 1, Aaron Castleberry sur, lcn. Western World Pub. Co.'s Foster & Billingsley 1, J. Bowlin sur, top chalk 2000 ft, dr 2220 ft chalk.

LOUISIANA GULF COAST

ACADIA PARISH—Yount-Lee Oil Company's Housierre Latrielle 10, Evangeline dist, 47-9s-2w, showing oil at 8675 ft, prep to set strainer.

CALCASIEU PARISH — Union Sulphur Co.'s Fee 768, Sulphur dist, dr rk 2220 ft; Fee 769, set 12¼-in cas at 1375 ft; Martha Moss 2, Lockport dist, preparing to test at 6570 ft. Hill Oil Co.'s W. S. Vincent 1, 25-10s-10w, ta at 3270 ft. Shell Pet. Corp.'s Heyd 2, set 9⅝-in cas 5130 ft, woc.

CAMERON PARISH—Brownie Babette Oil Co.'s R. A. Moore 1, Black Bayou dist, woc, 1200 ft. Calcasieu Oil Co.'s Unsurveyed Island 1, 24-12s-10w, lcn and dk. Union Sulphur Co.'s Gulf Ln, Pure Ls 1, East Hackberry, dr shale 5017 ft; Gulf Ln, Humble Ls 1, dr shale 5858 ft. The Texas Co.'s State E. Hackberry 9, E. Hackberry, lcn 2229 ft n and 918 ft e of sec Sec. 15-12s-10w, but in 12s-9w; State E. Hackberry 10, lcn 2375 ft n and 564 ft e of sec Sec. 13-12s-10w, but in 12s-9w.

IBERIA PARISH—Jefferson Lake Oil Co.'s Lake Peigneur 29, lcn 150 ft nw of No. 28 on line with Nos. 26 and 28.

IBERVILLE PARISH—Standard O Co. of La.'s Myrtle Grove-Wilbert 2, dr gbo 2276 ft; Gay 2, Bayou Choctaw, dr gbo 4871 ft; Schwing 5, Bayou Blue, standing at 2990 ft; Schwing 2, Bayou Blue, dr gbo 4048 ft.

JEFFERSON DAVIS PARISH—Shell Pet. Corp.'s Fontenot 1, Iowa dist, r at 5140 ft to set 9⅝-in cas, cored oil sn 5029-40 ft.

LA FOURCHE PARISH—The Texas Co.'s L. L. E. Leesville 4, Leesville, dr 3442 ft. Pop Oil Co.'s Esponge & Wizer 1, Leesville, in oil sn at 3725 ft.

ST. LANDRY PARISH—W. A. Agger's S. D. Cochran 1, 250 ft s and 250 ft e nwc fraction of Sec. 21-6s-5e, sp. Port Barre Oil Co.'s Sibelle 1, Port Barre, dr 2782 ft in shale. The Texas Co.'s Botney Bay Fee 11, Sec. 4-16s-4e, lcn.

TERREBONNE PARISH—The Texas Co.'s Lake Barre 12, Lake Barre, dr hd li rock, 2232 ft; L. L. E. Lake Barre 2, bldg dk; State Lake Pelto 5, Lake Pelto, dr salt 2310 ft, top salt 2295 ft. United Gas Pub. Serv. Corp.'s Minor Estate 2, 13 mi nw Houma gas field, dr sn 5335 ft.

VERMILION PARISH—Pure Oil Co.'s Alliance Tr. Co. 2, Gueydan dist, dr 3258 ft.

WEST FELICIANA PARISH—Como Oil & Dev. Co.'s Woods 2, 54-1s-4w, still hauling in dr stem.

SOUTH TEXAS

ARANSAS COUNTY—Big Lake Oil Co.'s Giesecke 1, St. Joseph's Island near Aransas Pass, lcn (dropped until work starts).

ATASCOSA COUNTY — American Central O&G Co.'s McConnell 2, Blk. 138, Baker sur, dr 1681 ft.

BASTROP COUNTY—Birdwell et al's White 1, Nancy Roberts sur, 4 mi se Belton, sd 540 ft. Humble O&R Co. & Sun Oil Co.'s Powers et al 1-B, Blk 197, 4 mi ne Bastrop, sd 3927 ft hard Taylor. Marts & Beaven's Wm. Bahm 2, J. Standifer sur, dr; R. L. Carter 1, Geo. Glasscock sur, 3 mi e Elgin, spud in.

BEE COUNTY—J. M. Davis et al's Geo. Ray 1, 1000 ft sw discovery, Jno. Williamson sur, Pettus (Damac) abn 4148 ft. Houston Oil Co.'s Portis 4, e offset Portis 3, A. Smalley sur, Pettus (Damac), abn 4215 ft. Humble Oil & R. Co.'s Laura Thompson 1, Garrett Roche sur, sd 5310 ft. Humble O&R Co. & Hulburt et al's J. C. Wood 1, P. T. Irrigation Co. sur, 5 mi se Beeville, sd 5077 ft. Mauldin et al's Fee 1, Geo. A. Kerr sur, Pettus (Damac) lcn. T. B. Slick Estate, Inc.'s, Geo. A. Ray 5, e offset Ray 3, G. A. Kerr sur, Pettus (Damac), sand 3886-91 ft, set 6⅝ inch csg 3885 ft, made small well, pull liner, wo. The Texas Co.'s L. Gremmel 4, John Pace sur, sw offset No. 3, Pettus (Damac), lcn; Gremmel 5, John Pace sur, sw offset No. 4, lcn.

BEXAR COUNTY—Alamo Nat'l Gas Co.'s G. J. Gembler 3, A. Menchaca sur No. 51, Eckert, re-dr 1162 ft. Anderson, Ingersoll & Miller's Stenburg, 9 mi sw San Antonio, F. Rolen sur, dr 600 ft (last rept). S. W. Blount's S. A. Land & Dev. Co. 1, 1 mi e of Medina River on Palo Alto Dr, 12 mi s San Antonio, sd 650 ft. Chiquita Oil Co.'s Kosub 1, J. W. Rialls sur, Cooksey, set 6⅝ inch csg 1400 ft, top sand Trevino sur, w Goliad, sd 4565 ft.

GONZALES COUNTY—Crowder Oil Co.'s Preston 1, W. W. Pace sur, spud in and sd. 1479 ft, td 1595 ft, put on pump. Eckert & Son's Louis Brehm 1, Eckert pool, lcn; Sandemer 9, Ekert pool, ru; Sandemer 10, Eckert pool, lcn. Gatlin Oil Co.'s I. A. Beck 11, J. Montez sur, Eckert pool, dr 300 ft. Jones-Volz's F. Bonkowsky 6, no rept. Ewell Neill's J. M. Watson 1, Martinez sur, 10 mi s San Antonio, show sulphur water 2328 ft, sd. Schneider, Rees et al's Claussen 1, ne San Antonio, S. J. & A. Sur. No. 17, sd 1143 ft. W. R. Swearingen et al's J. E. Halbardier 8, Perez sur, Eckert pool, dr 410 ft. W. K. Oil & Gas Co.'s Strunk 5, Montez sur, Eckert pool, move on.

BLANCO COUNTY—Hardy Sitton's Standeford 1, sur 155, 3¼ mi sw Blanco City, sd 1260 ft. Thomas Hicks et al's Specht & Wiedner 1, Thos. M. Fowler sur No. 27, 2 mi s Twin Sisters, sd 1635 ft (dropped).

CALDWELL COUNTY—Joe Bruner's Malone 1, A. Floyd sur, 2 lcns s Salt Flat, coring 2776 ft, Georgetown, show oil. T. W. Cole's J. M. Pierce 1, S. Seal sur, n Dunlop 2, Solomon Seal sur, 2¼ mi ne Luling, sd 2503 ft. Rex Kendricks et al's Virgil Carter 1, Isaac Allen sur, 3 mi sw Lytton Spgs., sd acct weather. Meyer Exploration Co.'s Walker 1, Solomon Seal sur, 3 mi w and n of Luling, dr 220 ft.

DUVAL COUNTY—John F. Camp's Weil 1, Sec. 570, 3½ mi sw Gov't Wells field, dk. Capps & Smith's Duval County Ranch Lands 1, Sec. 576, dk. Cole Pet. Co.'s Benavides 75, Blk 8, Sur 19, Mariano Arispe Grant, Cole-Bruni pool, set csg abt 3000 ft, td 3012 ft, completed 40,000,000 cu ft gas, 590 lbs pressure through 2-inch tubing, kill and deepen. Frank Garvis et al's Schallert 2, Blk. 10, Cain & Smith sur 55, Palangana Salt Dome, no rept. Humble O&R Co.'s Paul White 3, sur 58, Gov't Wells field, set 111 ft surface csg, re-dr (corrected). O. W. Killam's W. R. Peterson 1, Sec. 1, S. A. & M. C. sur, dr 2026 ft. Seacord & Putnam's Johnson 1, sur 44, ¾ mi n Rosita, spud in. SRC & Mag. Pet. Co.'s Duval Co. Ranch Land 7, SRC pool, sand 1736-45 ft, completed 300 bbls. Suttle et al's Bennett 1, sec 33, J. Portevent sur, near Rosita, n Gov't Wells field, ru. Thomas & Tarver, Inc.'s, Bishop Cattle Co. 6, sec 135, Gov't Wells field, top sand 2372 ft, td 2385 ft, set 6⅝ inch csg 2353 ft, completed 500 bbls. R. A. Thompson's A. Parr 1, A. Garcia sur, sd 3568 ft.

GOLIAD COUNTY—Benedum and Trees and Plymouth Oil Co.'s Parks 2, se cor B. S. & F. Sur No. 8, 500 ft s Parks 1, lcn. David E. Dunlap's A. T. Fromme 1, P. Dexter sur, lcn. Hoffman & Gooch's Fromme 1, (formerly Rheimenschneider) 10 mi n Goliad, Peter Dexter sur, originally abn 2312 ft, ru to deepen. L. Neal et al's Pettus 1, J. M. Pettus tract, Pedro

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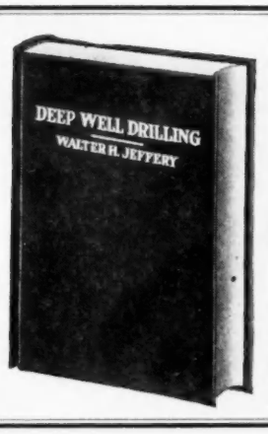

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GUADALUPE COUNTY—Barnhill's Hoffman 1, Dewett sur, between Seguin and Darst Creek, temp abn 685 ft. Harry Bruner's Jim Sherrill 2, Geo. Allen League, near Staples, reinstate, td 190 ft, to move rotary. Darst Oil Co.'s Hamilton 1, J. H. Williamson sur, ¼ mi e Tidal Seligman 1, ru. Humble O&R Co.'s S. E. Denman 4-C, 600 ft nw 3-C, Wm. Arrington sur, lcn. Luling O&G Co.'s J. D. Brown 1, C. Hall sur, near Kingsburg. Tidal Oil Co.'s Black 1, Valentine Bennett sur, 3½ mi sw Seligman 1, lcn.

HIDALGO COUNTY—B. H. Adam's (Barrett & Kanellos) J. D. Brock, blk 15, porcion 79, 15 mi nw Mission, sd 3800 ft, boiler trouble. La Joya O&G Co.'s W. L. Hart 1, w part of county, sd 4500 ft, contract depth. Dayle L. Smith Oil Co.'s (W. A. Taylor) Loma 1, Share 15, dr water well.

JIM HOGG COUNTY—H. D. Conley et al's Holbein 1, blk 7, sur 7, Reuben Holbein Oil lease, sub of Share 3, Las Animas Grant, core sand 1805 ft, to make dst. T. P. Morgan's Fee 1, Share 19, Palo Blanco Grant, dr 4060 ft.

JIM WELLS COUNTY — Mag. Pet. Co.'s Seelingson 1, Lot 5, Blk 11, A. Ramirez sur, 15 mi s Ben Bolt, dr 4576 ft.

KARNES COUNTY—Pickett et al's Lyons 1, spud in.

KENDALL COUNTY—Borgett et al's W. Haag 1, w Avery sur, sd 1250 ft.

KERR COUNTY—George Ball's F. A. Karger 1, move on. Evans and Gant's Jeff Love 2, Sec 1593, ½ mi se discovery, td 5879 ft, brown lime, underream and reset 5 3/16 csg to bottom of hole; Jeff Love 3, J. Martinez sur No. 1594, 600 ft e Love 1, lcn. Herbert & Halbert's J. D. Will 1, W. H. Hamilton sur, sec 1923, td 100 ft, to deepen.

KLEBERG COUNTY—H. Carter's R. H. Simmons 1, sec 7, King sur No. 2, dr 2700 ft. Joiner et al's (Barbee & Hunter) J. D. Finnegan 1, el Pasidio sur, 7 mi s Kingsville, sd 4007 ft.

LIVE OAK COUNTY—Coastal Oil Finding Co.'s A. M. Handley 1, C. S. Cobb sur, 12 mi w Beeville, dr 3200 ft. Coquat et al's (Phillips Pet. Co.) Sanger 2, 1280 ft nw No. 1, dr.

MAVERICK COUNTY — I. N. Boicourt's Bandera School Land 2, sd 2284 ft. Texas Gas Utilities Co.'s Chittim 8, sec 129, blk 7, I&GN sur, Chittim field, sd 4875 ft.

McMULLEN COUNTY—Prince Pet. Co.'s A. Grohman 1, blk 61, Prince Ranch sur, lcn. Jacob, Buzzini & Pickett's Jacob 1, W. H. Jacob sur No. 8, 150 ft nw Jacob 1, ru. V. G. Schimmel's F. A. Hale 2, 300 ft n No. 1, sur 63, Two Rivers Ranch sub, re-dr 1220 ft.

NUECES COUNTY—John F. Camp & Stanolind O&G Co.'s King 1, Sec. 23, Richard King Farm lots sub, 6 mi n Agua Dulce, spd in and sd to wo water well. Gulf Coast Oil Co.'s Perkins-Lagasse 1, sec 26, Shepherd sub, Saxet field, ru. Houston Oil Co.'s E. McGregor 1, Sur. No. 311, Saxet field, sand 4259-65 ft, show 45 ft oil, 90 ft mud, no pressure, wait on csg. Kepley et al's Speer & Hocker 1, Speer and Driscoll lands, Saxet field, ru. Rutherford Drlg. Co.'s Turner 1, Saxet field, ru. Saxet Oil Co.'s Dunn 6, Saxet field, dr 6075 ft, show sw.

REFUGIO COUNTY — Blanco Creek Oil Corp.'s Dammann 1, blk 18, Bonnie View Ranch sub, 8 mi e and s Refugio field, sd 4685 ft. G. C. Dixon's P. M. Peck 1, sec 24, Bonnie View Ranch, sd 100 ft. Humble O&R Co.'s M. V. O'Conner 2, John Keathing sur, near Victoria line, 933 ft n and 75 degrees w O'Conner 1, set 13⅜ inch csg 2314 ft, woc. E. M. Jones' Josephine Mitchell 1-B, Refugio sur, dr 6920 ft, sand 6875-6904 ft, oil at top, sw at bottom.

SAN PATRICIO COUNTY—Atlantic Oil Co.'s (Welder Oil Co.) Welder 3, 900 ft n No. 2, old gasser 3659-61 ft, to deepen. John F. Camp's Jackson 1, sec 50, G. H. Paul sur, 3 mi n of Edroy, sand 2532-38 ft, oil and gas show, dst seat gave away, dr deeper.

STARR COUNTY—Bennett Oil Co.'s Seabury 1, Sec. 5, Porcion 76, ¼ mi n Los Olmos field, sand 440-50 ft, show gas, testing. Coastal O&G Co.'s Kelsey Bass 1, Los Olmos, dr 300 ft. Devenport et al's Fee (Wells) 1, C. O. Newman Sub, Sur 33, El Benadito Grant, td 1095 ft, attempt to set csg. Heard & Heard's (Sioux Oil Co.) Goodrich 1, tract 5, Porcion 81, 1½ mi n Rio Grande City, sand 1358-70 ft, set csg, woc. Hooks and Weaver's Kelsey Bass 4, Blk 2, Sur 6, top sand 414 ft, td 449 ft, pump 25 bbls; K. Bass 5, blk 2, sur 6, Los Olmos, lcn. Los Olmos O&G Co.'s Kelsey Bass 10, sur 6, sub of Porcion 75-76-77, lcn. M. A. Landrum's K. Bass 1, sec 6, sub of Por, 75-76-77, Los Olmos sur, dk; K. Bass 2, sec 6, Los Olmos sur, lcn. Quien Sabe O&G Co.'s H. K. Kusch 2, Por. 75, Tract 11, dr 325 ft; H. K. Kusch 1-B, Por. 76, Tract 7, nw cor blk 11, lcn. Rio O&G Co.'s K. Bass 2, Sur 6, Los Olmos, dr 400 ft. San Marcos Dev. Co.'s Ivey 7, Share 8, Por. 75-76-77, dr 210 ft; Ivey 8, lcn. Stryalls Oil Corp.'s M. E. Salinas 1, Por. 80, Share 38-C, dr 860 ft, last rept. Ed Sullivan et al's K. Bass 1, sur 7, ¾ mi se Los Olmos pool, dry and abn at 602 ft. R. B. Suttles' Guerra 1, Porcion 110, dr 810 ft, last rept. J. A. Tarver, A. K. Bass 1, sec 77, B 7, ¾ mi due s Los Olmos pool, dr 402 ft; A. K. Bass 2, (1), S 76, B 7, Camargo sur, ¾ mi s field, sand 458-473 ft, completed 25 bbls. Jess Williams Welsh 1, Pedernal Grant, sd 552 ft.

TRAVIS COUNTY—Bass & Fuch's R. A. Chadwich 1, A. C. Caldwell sur, dk. Fritz Fuch's W. M. Schaeffer 1, A. C. Caldwell sur, sd 520 ft; C. R. Franklin's J. Wilson 1, A. Alexander sur, sd 565 ft.

VICTORIA COUNTY—C. B. Bunte & C. R. & M. Drlg. Co.'s Keeran 2, Martin de Leon Grant, Keeran field, w of No. 1, ru. Houston Oil Co.'s McFadden 1, 2/3 mi nw Konrad 1, ne Victoria, lcn. T. B. Slick Estate's McFadden 2, 3500 ft nw 1, J. Varin sur, spud in. The Texas Co.'s McFadden 4, J. M. Rine sur, 2800 ft n No. 3, ru.

WEBB COUNTY—French Oil Corp.'s Benavides 7-A, sur 659, West Cole field, lcn. O. W. Killam's Bruni (Ranchito) 4, J. V. Borrego Grant, 1070-75 ft, dst, show gas. Nordan & Morris' Gates 1, 10 mi sw Gov't Wells field, move on. Power & Detterheim's Cowan & Gross 1, sur 1606, sd 300 ft. Rosenberg, Johnson & Peacock's Laurel 1, Blk. 10, sur 27, Carolina Texas pool, dr 2320 ft. W. R. Shanklin's Ellison 1, blk 2, sur 466, dt 1150 ft.

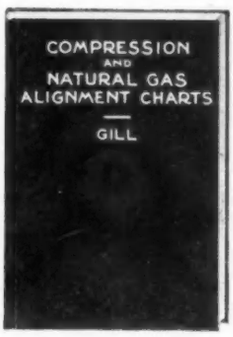
WILLIAMSON COUNTY — Burns et al's Wilder 1, R. Owens sur, sd 1496 ft. Hayes and Gee's E. G. Johnson 1, B. C. Low sur, s Georgetown, sd 1595 ft. McLean's et al's Miller 1-A, Manlove sur, sw No. 1, spud in and sd. McNeil et al's W. R. Love 1, T. E. Shell sur, spud in. Peterman et al's Galler 1, 1 mi nw Thrall, dr. R. S. Wilson's J. S. Speckels 1, J. Jordan sur, 1 mi n Coupland, sd 875 ft.

ZAPATA COUNTY—Geo. Ball's Gutierrez 1, sd 2065 ft, to deepen. Ballard & Mercer's Flores 1, Blk. 27, Marks sub, Porcion 37, dr 1880 ft. E. R. Black & Paul S. Williams' Alworth 1, Comitas Grant, lcn. Borgan & Belcher's M. Garza Estate 1, Blk. 62, C. A. Douglas sub, Comitas Grant, dr 2010 ft. J. M. Blair & Son's Montemayor 1, blk 1, sur 63, Escobas field, spud in. Daniel & Hill's Montemayor 2, sur 64, blk 7, dr 1484 ft, sand, dry. Eddington & Niles' Trevino 1, Share 34, lcn. F. H. Etheridge's Winch & Henne 3, blk 10, sur 286, spud in; Winch & Henne 4, blk 10, sur 286, lcn. O. W. Killam's Medina 4, share 34, Fansler Partition, Comitas Grant, Escobas field, sand 1458-64 ft, completed 200 bbls. K. M. Oil Co.'s I. Cuellar 2, sec 13, blk 7, 2 mi e Escobas field, make lcn. M. V. Lee's Trevino 1, sur 66, blk 7, Escobas, lcn. D. M. Shafer's M. Garza Estate 1, C. A. Douglas sub, Zorro Ranch, Las Comitas grant, ru. S. R. C. Oil Co.'s Monemayor 6-D, blk 10, sur 64, s offset Daniels' Hill well, sd 1479 ft. Trevino Oil Co.'s M. Garza 1, blk 36, Comitas sur, dr 825 ft; M. Trevino 1-B, Sec. 412, Escobas, td 1251 ft, 20 bbls; M. Trevino 2-B, sec 412, blk 14, lcn. Winch & Billings' Jose Bustamante 9, Share 35, Fansler Partition, Comitas Grant, Escobas field, td 1528 ft, completed 200 bbls.

ZAVALLA COUNTY — Carpenter et al's Wolf 1, Amos Beaty and Moulton Block A Survey, sand 731-57 ft, 3 ft break of rock, show gas, set csg 726 ft, cement gave way, recement, woc.

COMPRESSION
AND
NATURAL GAS
ALIGNMENT CHARTS

By THOMAS T. GILL



The charts in this book have been found useful in solving field problems arising in connection with the measurement, compression and transmission of natural gas, and in the manufacture of natural or casinghead gas. As many of the formulas in common use in natural gas operations are of an impirical nature, with constants that must be evaluated under varying conditions, it will be found that alignment charts are sufficiently accurate for nearly all purposes except for metering large quantities of gas, and here they serve as an excellent check on other calculations. Contains 41 charts, 65 problems. Price $3.50 Postpaid.

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KANSAS

SUMNER COUNTY—Trees Oil Co. & Shell, Springate 1, ne se sw, 6-34-2e, dr by 10-inch, td 2285 ft.

KINGMAN COUNTY—Panhandle Drlg. Co., Wetherall 1, c se nw sw, 20-28-10w, sd 890 ft.

PRATT COUNTY—Ninnescah O&G, Hardesty 1, sw se se, 28-27-11w, rog.

EDWARDS COUNTY—Mid-Kansas, Converse 1, sw ne ne, 30-24-18w, rog.

HARVEY COUNTY—Liggett et al, Davis 1, c sw se ne, 7-24-1e, sd 2500 ft.

FINNEY COUNTY — National Ref. Co., Wells 1, sw c, 12-23-30w, dr 4100 ft.

HARVEY COUNTY—Joe Liggett, Voshell 1, ne sw, 3-23-3w, lcn.

RENO COUNTY—Jarvis & Wright, Rainbow 1, nw nw se, 33-22-7w, rig.

HARVEY COUNTY—D. R. Louck, Regier 1, sw se nw, 9-22-3w, lcn.

RICE COUNTY—Joe Liggett et al, Thodel 1, c nw nw 11-21-7w, spd and sd.

McPHERSON COUNTY—Twin Drlg. Co. et al, Farver 1, sw se, 16-20-1w, Wx 3486-95, ft, hfw, D&A 3495 ft.

BARTON COUNTY—Skelton Oil, Ott 1, c se se, 16-19-14w, sd 3375 ft csg trbl.

RICE COUNTY—Gypsy, Steckle 1, c ne nw, 31-19-10w, top sil. 3299 ft, td 3325 ft, hfo.

McPHERSON COUNTY — Deitrick et al, Sinclair 1, se sw, 25-19-1w, rog.

BARTON COUNTY — Morgan & Flynn, Haas 1, ne sw, 30-18-15w, lcn.

MORRIS COUNTY—Urschell et al, Bersuch 1, c nw se nw, 10-17-7e, sd 915 ft.

MORRIS COUNTY—Kastle et al, Furney 1, ne se, 16-16-8e, spd and sd. Hankenson et al, Cessnum 1, sw se, 24-17-8e, sd 2625 ft

RUSSELL COUNTY — Tom Palmer et al, Pasek 1, c se, 3-14-11w, top sil. 3385 ft, td 3427 ft, ur 6-inch.

OSAGE COUNTY—Riggs-Smith, Wood 1, c se nw, 31-14-15e, td 2200 ft.

RUSSELL COUNTY—James Brennan, Walz 1, cwl e½ nw 29-13-11w, ru and sd. Twin Mounds Oil Co., Weis 1, c w½ ne nw, 30-13-4w (owd) td 2710 ft, sd.

DICKINSON COUNTY—Severs et al, Livingood 1, ne sw, 13-13-2e, sd 4752 ft.

SHERIDAN COUNTY — Flo et al, Shoemaker 1, se sw sw, 27-27-26w, 6-inch 4143 ft, dr 4180 ft.

RAWLINS COUNTY—Danciger et al, Unknown 1, sw c, 3-2-35w, 6-inch 3875 ft, hfw 3925 ft, sd.

OKLAHOMA

ALFALFA COUNTY—T 27n, R 11w, Sec. 12, Smith Bros.'s Forbes 1, ne c se nw nw, sd 1420 ft.

KAY COUNTY—T 27n, R 2e, Sec. 9, Mummer et al's Sornick 1, nw c se, sd 3693 ft.

GRANT COUNTY—T 25n, R 4w, Sec. 22, Cowden's Vollmer 2, ne c se ne sw, sd 5640 ft.

ALFALFA COUNTY—T 24n, R 11w, Sec. 14, J. V. Bailey's Acre 1, c sw ne, sd 5502 ft.

GARFIELD COUNTY—T 24n, R 6w, Sec. 9, Pulse & Beamer's White 1, se c nw, sd 5850 ft.

BLAINE COUNTY—T 19n, R 10w, Sec. 13, Washoma's Phillips 1, c nw sw, sd 5120 ft.

LOGAN COUNTY—T 18n, R 3w, Sec. 33, Healey et al's Quier 1, se c sw, sd 3970 ft.

KAY COUNTY—T 28n, R 3e, Sec. 24, Atkinson et al's Hays 1, se c ne, td 3310 ft d&a.

PAWNEE COUNTY—T 20n, R 5e, Sec. 6, W. A. Rookstool's Berry 1, nw c ne sw, sd 1951 ft.

LINCOLN COUNTY—T 17n, R 5e, Sec. 26, Mote et al's School land 1, nw c, ur 12½ inches at 1325 ft. T 14n, R 3e, Sec. 2, Hilton Phillips et al's Phillips 1, sw c nw, dr 3150 ft.

CREEK COUNTY—T 14n, R 7e, Sec. 18, Cal Cul's Holleyman 1, se ne se, fsg 705 ft.

LINCOLN COUNTY—T 13n, R 6e, Sec. 8, Atlantic's Beebee 1, ne sw sw, sho oil 4207-60 ft coring.

PITTSBURGH COUNTY—T 7n, R 14e, Sec. 34, Tape Oil Co.'s Fulsom 1, se c, sd 1705 ft.

LATIMER COUNTY—T 6n, R 19e, Sec. 16, P. English's Weaver 1, c nw se, sd 1542 ft.

PITTSBURG COUNTY—T 5n, R 14e, Sec. 9, W. B. Bailey's Coal land 1, ne c sw, dr 1250 ft.

SEMINOLE COUNTY—T 10n, R 6e, Sec. 19, Bunte et al's Bruner 1, se c nw, rig.

ROGER MILLS COUNTY—T 12n, R 24w, Sec. 23, Ute Oil Co.'s Williams 1, c sw, sd 5150 ft. T 11n, R 26w, Sec. 4, J. J. Rook and Palmer's Davis 1, c nw ne (owd) dr 3420 ft.

CANADIAN COUNTY—T 10n, R 6w, Sec. 1, J. V. Bailey's Robinson 1, c ne nw, sd 150 ft.

WASHITA COUNTY—T 9n, R 17w, Sec. 23, Miley Pet. Corp.'s Chapman 1, ne c sw, rig. T 8n, R 19w, Sec. 29, Cooper & Terhune's Blocker 1, nw c, sd 2757 ft. T 8n, R 18w, Sec. 21, Burns & Prince's Dock 1, sw c, sd 1265 ft.

GREER COUNTY—T 7n, R 21w, Sec. 23, French et al's Murphy 1, sw c nw se, sd 1654 ft.

CADDO COUNTY — T 5n, R 9w, Sec. 6, Mid-Kansas & Ramsey's Culp 6, nw c ne; td 10,079 ft small sho oil and gas; pb 6780 ft shot 80 qts 6750-80 ft no sho; pb to 6084 ft. Ripped pipe at 6077-89 ft sho ¶10 and 20 bbls salt water; sd.

COMANCHE COUNTY—T 4n, R 12w, Sec. 33, Snodgrass et al's Willetts 1, ne c nw, sd 515 ft.

GARVIN COUNTY—T 2n, R 2w, Sec. 24, Malernee's Phillips 1, ne c sw, sd 4800 ft.

COAL COUNTY—T 1s, R 8e, Sec. 2, Rabial Oil Co.'s Richardson 1, ne c nw, sd 1450 ft.

ATOKA COUNTY—T 3s, R 10e, Sec. 18, Brockshire et al, Quinn 1, nw c, sd 1720 ft.

NEW MEXICO

BERNALILLO — Norrins Realty's Pajarito Grant 1, 29-9n-2e, dr 1243 ft, carry 12½-in.

DONA ANA—Middle Sts. O&G Co.'s Boretzi 1, 14-26-5e, rigging rotary.

GUADALUPE — N.M. Prod. & Ref. Co.'s McMillan 1, 24-5n-16e, dr 4025 ft in granite wash.

LEA—Baker Oil Co., Inc., sw nw 15-13s-33e, mvg in.

LUNA—Angelus O&M Co.'s State 3, se 30-21-10, try to reset cas at 6171 ft.

OTERO—Ernest et als 1, se 20-25s-7e, stand 1445 ft. Pasotero Oil Corp.'s Evans 1, sw 325s-30, rig.

RIO ARRIBA—Berrenger et al's Hartman 1, ne 8-29n-7w, sd 825 ft. Governador Oil Co. 1, 15-29n-7w, dr 2905 ft, carry 5 3/16-in casing last report.

ROOSEVELT—Peterson et al's Good 1, 32-5s-30e, rig up.

SAN JUAN—Kutz Canon O&G Co.'s Day 1,

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se 20-28n-10w, sd 3742 ft. Rio Grande Dev. Co. 2, 9-26-11, sd 1771 ft. Continental Oil Co.'s Rattlesnake 24, 1-29n-19w, run sand tester 6975 ft. San Juan Leaseholds' Bowman 3, nw 30-30-15, sd 2685 ft. Williams et al's Stallings 1, sw 17-25n-15w, stand 150 ft.

SANTA FE—Jones, Owsley et al, 5-10n-9e, sd 435 ft. N. M. Securities Co., sw 6-10n-7e, sd 480 ft.

SAN MIGUEL—Starr Oil Co.'s Adams 1, ne 25-17n-16e, fsg pipe 5095 ft. Hershfield Dev. Co.'s Cabra Springs 1, ne 21-12n-22e, dr 1700 ft last report.

COLORADO

ADAMS—Hills Dome Lease Dev. Co., se 27-3s-54w, resum at 3790 ft.

ARAPAHOE—McDeb Dr. Co., Fitzsimons 1, ne 7-4s-66w, show 5942 ft.

ARCHULETA—Oil City Pete. Co., Fitzhugh 1, sw 34-33n-1e, topped lakota at 670 ft.

BOULDER — Julius Williams' Degge 1, 6-1n-71, dr bel 1250 ft. Ahstrand et al's Woodley 1, nw 8-3n-70w, sd 565 ft.

ELBERT—Belmont Oil Co., sw 27-3n-64w, sd 3745 ft. Progressive O&I. Co.'s Pease 1, se 27-10s-66, sd 3820 ft.

EL PASO—Gulf States Oil Corp.'s Carson 2, ne 10-16-66, sd 1126 ft. Utemore Synd.'s Carson 2, ne 10-16s-66, to resum 1025 ft.

GRAND—Oil Mineral Laads, Inc.'s McElroy 1, sw 14-2-81w, sd 545 ft.

JEFFERSON—Ruby Hill O&G Co.'s Braden 1, se 34-4s-59w, dr 4200 ft.

LaPLATA—McGarr Pete. Co.'s Pinon Mesa 1, ne 34-33-12, rig up. J. W. Irwin & Co.'s Doescher 1, nw 29-33-13w, sd 3175 ft. Phipps et al, sw 9-33-13, td 520 ft.

LARIMER—Mayer et al's Reed 1, nw 28-4n-60, sd 3150 ft. Natural Gas & Oil Co.'s Meade 1, se 17-4n-69w, sd 1900 ft. Colo. Prod. Inc.'s Foster-Motz 1, se se 17-4-60, cave, sd 1435 ft. Colo. Prod. Inc.'s Hogsett 1, se ne 20-4-60, spd and sd. C. Leonard Smith's State 1, 36-12n-70, prep to res, td 760 ft. Poudre River Oil Co., se nw 34-8n-69w, sd for 8¼-in, td 1996 ft. Consolidated Drg. Co.'s Maxwell 1-A, ne 25-8n-70, to res at 285 ft. Coulter et al, 4-4n-70, spd 150 ft.

LINCOLN—Eastern Colo. Oil Corp.'s State 1, 36-14n-57w, sidetr tools, td 3425 ft.

MOFFAT—Ohio Oil Co.'s Bogenschulta 1, se 9-6n-81, ready to test gas at 2781 ft.

MORGAN—Badger Creek O&G Co., sw 2-2-57, stand 1340 ft. Platte Valley Pete. Co., sw 29-6n-60, cellar.

PARK—So. Park O&G Co.'s Milligan 1, se 13-8s-76w, co 2787 ft. South Park O&G Co.'s Esche 1, ne 5-9s-76w, sd 2442 ft.

RIO BLANCO—California Co.'s Raven 1, se 20-2n-102, dr 3696 ft.

ROUTT—Mid-Colo. Pete. Corp.'s Omholt 1, se 29-4n-97, sd 1700 ft.

WASHINGTON—Middlemist Oil Co.'s Middlemist 1, se 14-4-56, sd 1503 ft.

WELD—Conoco's Gadbois 1, sw 24-6n-61w, shot, td 6701 ft, show 27 bbls on 5-day swb test. Reiter-Foster Oil Co.'s Johnson-Juhl 1, se 14-6n-61, plug back to test Cordell sand.

MONTANA

BROADWATER—Capitol O&G Co., nw 7-8n-1e, dr 2000 ft.

CARBON—Corbett Roy. Co., sw se 1-6s-23e, reset 8¼-in at 1120 ft. Jack Creek O&G Co. 1, se 15-7s-23e, td 1335 ft, abd lost hole, skd rig. Ohio Oil Co.'s Kutckinski 1, 15-7s-21e, dr 4243 ft. Midland Oil Synd., nw 24-6s-23e, dr 150 ft.

CARTER—E. T. Moorehead, sw 36-4s-57w, wait for 12½-in at 350 ft.

CASCADE—Buscher & Cassady's Johnson 1, se 19-22-3e, sd 1387 ft, hfw. Charles Merz et al's Sheffels 1, nw 4-21-4e, to run 6-in to 905 ft.

FALLON—H. W. MacDonald 1, sw 28-8n-60e, 8¼-in cem 1682 ft, co.

FERGUS—Melton Corp. 1, sw 24-21n-17e, dr 3080 ft, carry 8¼-in. Landheim-Romunstad 2, ne 3-17n-20e, set 6⅝-in at 2116 ft sd 2600 ft.

GALLATIN — Mont. Gas & Pete. Corp.'s Adams 1, 35-1n-2e, dr 700 ft. Gallatin Valley Oil Co.'s Haglund 1, sw 13-34-6w, sd 2539 ft.

GLACIER—Fulton Blackfeet Oil Co., ne 28-36-12w, recem 2950 ft.

GOLDEN VALLEY—Golden Valley Oil Co., 28-6n-22, dr 2970 ft.

LIBERTY—Northland O&G Corp.'s Yurman 1, sw 32-33-5e, dr resum 3820 ft. California Co.'s Ross 1, ne 3-33-6e, dr 2790 ft.

MUSSELSHELL — Minn-Flatwillow Pete. Co. 1, sw 7-11-31e, to res at 2556 ft.

SWEETGRASS—Shoshone Cons., nw 23-2n-15e, stand 5500 ft.

TETON—California Co.'s Sullivan 1, nw 34-28-7s, sd for winter, td 2810 ft. Earl Oil Corp's Gad 1, se 22-22-8w, sd 2850 ft to resume Apr. 1.

TOOLE—Oregon Synd., se 20-36-2e, damaged casing shoe, td 2268 ft. Western Nat'l Gas Co., nw ne 26-37-4e, to be dd from 1813 ft in spring.

YELLOWSTONE—Pan-American Oil Synd., 23-2s-24e, dry and abd., td 2360 ft. Peter Antonioli ne ne 21-2n-25e, casing shoe lost, sd 2470 ft.

WYOMING

CARBON—Midwest Refining Co.'s U. P. 27, 27-11-81, sd for winter. Prairie O&G Co.'s Bunker Hill 1, 29-27-87, sd for winter, td 6147 ft.

CONVERSE—John Ackard, se 24-33-72, sd 1820 ft.

CROOK—Northwestern Oil & Natural Gas Co., 6-54-60, sd 1585 ft for winter.

FREMONT—Wiebolt et al., 35-33-99, wait for 5 3/16-in at 2620 ft. Yellowstone Oil Co., sw 14-39-94, stand 1000 ft last report. Ward O&G., 28-34-90, mvg in rotary.

LINCOLN — Wyo Prod. Co., 14-24-113, td 1700 ft.

NATRONA—Mutual Oil Synd.'s Midway 2, sw se 14-35-79, ready to spud. Summit Oil Co., 21-33-80 sd 1387 ft. Wyo. Imperial Oil Co., sw 13-33-79, rig up.

NIOBRARA — Fall River Roy & Internat'l O&R Co.'s Joint Globe 1, 2-39-61, sd 600 ft.

SHERIDAN—R&D Oil Co., se 21-57-87, sd 1300 ft.

WASHAKIE—Bales Oil Trust, nw 31-48-80, sd for winter at 1100 ft.

WESTON—LeFaivre Oil Synd., se 29-45n-68w, stand 1250 ft. Julius Peters et al's Weitzell 1, se nw 30-46-64, resums 3400 ft to dr 100 ft deeper. Stockade Anticline Synd., 32-45-60, sd. Gose Oil Synd.'s Gose 1, 28-47-65, sd 5050 ft.

NORTHERN CALIFORNIA

Company, Well and Location—	Initial Production Bbls	Depth
SAN JOAQUIN COUNTY—		
Union Oil Co.'s T.L.W. 1, 14-3-6...	*	5511

KERN COUNTY

BUTTONWILLOW—Graham-Loftus Oil Co.'s Carmel 1, 20-27-22, dr shale 6500 ft. General Pet.'s Morris 1, producing some gas, td 2615 ft. Milham Exploration Co.'s Kern 10, 5-28-23, shut in 2690 ft; Whitaker 1, 8-28-32, dr shale 1975 ft.

DEVIL'S DEN—Cumberland Oil Co.'s Cumberland 2, 17-26-18, sd 3226 ft, Totem Oil Co.'s No. 1, 29-25-19, rigged to sp.

McKITTRICK—T. H. Purman's No. 1, 22-30-22, dr shale 3385 ft Welport Oil Co.'s No. 8, 26-29-21, making test 1300 ft, may deepen.

SEMITROPIC — Fullerton Oil Co.'s Core Hole E, 9-28-24, dr shale 718 ft.

WEED PATCH—Osborn and Colter's Duff 2, 15-30-29, pumping 12 bbls 14 gravity oil, td 2006 ft, may shut in.

WHEELER RIDGE—Barnsdall's K. C. L. 1, 15-11-20, dr gray sand 4378 ft. Descanso Oil Co.'s Tejon 1, 31-11-19, dr hard sand 2035 ft.

SANTA BARBARA COUNTY

CARPENTERIA — Texas' McDougal Core Hole 3, 34-4-25, dr surface sand 200 ft.

GOLETA—General Pet.'s Hollister 1, 10-4-29, 6⅝-in cas cmt 774 ft, plugged to 903 ft, td 1329 ft; More 3, 22-4-28, plugged to 4375 ft, shut in as gas well, td 6912 ft. Strickland and Tippett's Duncan 1A, 19-4-27, co 4691 ft.

LOS ALAMOS—Barnsdall's Careaga 1, 31-8-33, dr shale 2770 ft. N. S. Wilson's Orena 1, 2-7-33, will deepen from 3450 ft.

SANTA MARIA—O. C. Field Gasoline Co.'s Norswing 1, 8-9-33, plugged to 5127 ft; pumping water and small amount of oil. Western Gulf's Bradley 1, 5-9-33, fsh 8566 ft.

SANTA ROSA ISLAND—Standard's Island 1, bldg roads, lcn not announced.

VENTURA COUNTY

CONEJO—American Oil Co.'s Powell 1, 33-2-20, co 1575 ft. Sycamore Oil Co.'s Hansen 1, 24-1-20, dr hard sand 1415 ft. Triunfo Oil Co.'s No. 1, 24-1-19, dr shale 3000 ft.

HOPPER CANYON — Bardeen Oil Co.'s Lankershim 2B, 13-4-19, dr 200 ft.

PIRU—Torrey-Ventura Oil Co.'s No. 1, 32-4-18, 13⅜-in cas cmt 880 ft, td 930 ft, may deepen.

RINCON—Woodruff Oil Co.'s Lomas 1, 4-3-24, bldg roads.

SOUTH MOUNTAIN—H. H. Bell's Lemon 1, 22-3-21, dr shale 2345 ft.

MISCELLANEOUS

FRESNO COUNTY—Kingsburg Exploration Co.'s Muller 1, 29-16-23, co 2420 ft, may make test.

KINGS COUNTY—Magee and Stone's Alpaugh 1, 34-24-22, rigging up rotary. Knudsen and Schmidt's Avenal 1, 36-23-17, sd 5715 ft. Eagle Oil and Gas Co.'s No. 1, 15-23-20, co 1125 ft. Irma Investment Co.'s No. 2, 7-23-20, flowing some gas, td 1225 ft. Kettleman National Oil and Gas Co.'s No. 1, 18-22-19, deepening from 1010 ft. Tulare Basin Oil Co.'s Goodfellow 1, 2-23-19, will deepen from 1185 ft. Valley Exporation Co.'s Dudley 1, 12-23-19, 8⅝-in cas cmt 975 ft, td 1302 ft.

NAPA COUNTY—Napa Oil Co.'s Griffith 6, 7-8-3, 8⅝-in cas cmt 2850 ft.

SAN LUIS OBISPO COUNTY—Emerich Oil Corp.'s No. 1, 13-28-12, dr gray sand 1820 ft. J. D. Martin's Pricco 2A, 5-31-13, redr 3025 ft, td 3090 ft.

TULARE COUNTY — Gravity Exploration Co.'s Buck 1, 11-24-23, rigged to sp. Ellis and Sanford's Alpaugh 1, 20-24-23, plugged to 1500 ft, may make test, 4¾-in cas cmt through perforations.

YOLO COUNTY—Pacific Northern Gas and Oil Co.'s Guinda 1, 23-12-3, conditioning hole with heavy mud, will continue test, td 2007 ft.

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SOUTHERN CALIFORNIA

CALABASAS—L. W. Rucker's No. 1, 26-1-17, co 900 ft, will deepen.

HERMOSA BEACH—Corniel Oil Corp.'s No. 1, 31-3-14, sd 3100 ft. Tulsa Oil Co.'s Hermosa 1, 6-4-14, co 3140 ft. Westwood Oil Producers' No. 2, 6-4-14, co to 2145 ft, pumping heavy oil and water.

LYNWOOD—William L. Jones' Graham 1, 31-2-12, co 1050 ft.

NEWPORT—Ajax Pet. Co.'s B. G. 1, 16-6-10, dr gray sand 7270 ft.

OLINDA—Graham-Loftus Oil Corp.'s No. 1, 18-3-9, pumping water above plug at 4100 ft, td 9284 ft, may complete in upper sand.

PLAYA DEL REY—Cooperative Pet. Development Co.'s No. 1, 26-2-15, rig.

SAN FERNANDO—Willard Marble's No. 1, 6-2-16, sd 1310 ft.

WILMINGTON—Ranger Pet. Corp.'s Watson 2, 21-4-13, pumping 50 bbls 14 gravity oil, td 3784 ft. Albert Stevenson's No. 1, 21-4-14, lcn. Walter I. Barcus' Lupie 1, 28-4-13, new lcn.

NORTH LOUISIANA

Company, Well and Location	Initial Production Bbls.	Depth
BOSSIER PARISH—		
Plain Dealing O&G Co., Nattin 1, 15-22-14	*	2890

BOSSIER PARISH — Plain Dealing O&G Co.'s Nattin 1, se nw 15-22-14, 4½ cas 2882 ft, 150 ft oil in hole but refused pump, dry abn, td 2890 ft. Dr. Hankins et al's Newell 1, 12-19-11, sd 1890 ft. Triangle Drilling Co.'s Nuckolls 1, sw ne 7-22-12, dr 2218 ft.

CADDO PARISH—Pelican Nat. Gas Co.'s Cooper 1, 29-18-14, ta 3648 ft, red shale and lime. Louanna O&G Co., Inc.'s, Hammock 1, se se 32-19-15, elev 258 ft, top bro chalk 1350 ft, base 1735 ft, sd 2482 ft. Calatex O&G Co.'s Hudson 1, 8-16-16, dr 2725 ft.

CALDWELL PARISH—Monroe Pet. Corp.'s Burton 1, 36-12-2e, sd acct titles, td 2986 ft. Carter Bell et al's Taylor 1, 17-14-4e, 12½ cas 110 ft, sd 1100 ft.

DE SOTO PARISH—A. R. Smith's Horn 1, nw se 15-12-16, sp and sd. Rellit O&G Co.'s Cannon Hrs. 1, 12-11-16, sd 1965 ft. E. T. Oakes' Johnson 1, 30-13-15, dr 3301 ft. Walters & Nicholson's Jim Guy 1, 3-11-13, sr, td 1785 ft. De Soto Dev. Co.'s Nickie 1, sw se 7-13-12, dk.

NATCHITOCHES PARISH—C. M. Talley et al's Talley 1, 29-11-10, sd 1380 ft. J. W. Cooper et al's Cooper 2-A, 35-11-10, sd 1515 ft. Gerson et al's Smith Island 1, sw nw sw 11-10-8w, 12½ cas 90 ft, gas and sw flow killed, arr skid for new hole, td 585 ft sand. R. A. Keator's Stephens 1, 25-10-6w, 12½ cas 178 ft. sd.

OUACHITA PARISH—S. C. Wilson's W. L. Williams 1, sw se 5-16-1e, 12½ cas 180 ft, cored 1 ft oil sand 2760 ft, arr set cas.

RICHLAND PARISH—National Gas Co.'s Singletary 1, 20-18-7e, sd 2515 ft.

SABINE PARISH—J. J. Kean's Belton 1, nw se ne 31-9-13, 8-inch at 1590 ft, top chalk base chalk 2115 ft, dr 2983 ft, lime and shale. R. L. Gay, Tr.'s, Long-Bell A-1, nw nw 10-8-13, elev 265.4 ft, top Glen Rose 4204 ft, recov 6 ft core of oolitic lime 4666-72 ft, (S.L. M.), sr at 4600 ft, td 4772 ft (corrected depth). Texas Co.'s Giaque B-1, 10-7-13, dry arr abn, td 2490 ft. A. H. Thames' Edwards Est 1, 8-8-13, arr abn, td 1200 ft. George LeGrand's McGough 1, 3-8-10, dk. Root Ref. Co.'s Peterson 1, sw ne 34-7-13, sd 2243 ft. Loring Oil Co.'s Bowman-Hicks 18, sw nw 15-7-12 elev 264.1 ft 15½ cas 100 ft, 9¾ cas 3950 ft, top lower Cretaceous 3998 ft, pumping in mud to hold in gas, td 4595 ft(corrected depth). Frank Foster, Inc.'s, Stevens 1, ne nw nw 20-9-11, elev 269 ft, 10-inch 100 ft, chalk 1765-2235 ft, blew out est 20 to 25 mil ft day spray sw, trace oil, while coming out hole with sand core at 3357 ft, killed gas with baroid, ds still in hole, arr run 6⅝ cas, td 3357 ft sand (Washita). Hudson & Bird's Walden 1, sw ne 26-8-11, elev 290 ft, sd 2454 ft chalk.

TENSAS PARISH—A. R. Willis' Curry 1, 39-11-12e, sd 3545 ft. Stovall Drilling Co.'s Miler 1, ne sw 10-10-10e, lcn.

WEBSTER PARISH—Wadley et al's Matthews 1, 11-23-9, ru and wo.

ARKANSAS

CLAY COUNTY—S. C. Jeffus, Tr.'s, Underwood 1, 4-20-8e, sd 1260 ft.

CLEBURNE COUNTY—Frank S. Craver's Donithan Lbr. Co. 1, 33-11-9, sd 3470 ft.

CLEVELAND COUNTY—Crum & Stilwell's Bell 1, 10-10s-10w, rigged up and sd.

COLUMBIA COUNTY—Kendall Oil Co.'s Hillman 3, nw ne 20-10-13, lcn. Jno. James, Tr.'s, Fordyce Lbr. Co. 1, 11-9s-15w, arr core at 2522 ft hd sand.

DREW COUNTY—Cooperative Dev. Co.'s Ogles 1, ne nw 35-15-5, sd 1890 ft.

HOT SPRINGS COUNTY—Starr Oil Co.'s Cunningham 1, 11-5-16, sd 1262 ft, shale and bldrs.

LINCOLN COUNTY—L. B. Cook, Tr.'s, McGehee Pltg. Co 1, 5-8s-7w, sd 2985 ft.

LITTLE RIVER COUNTY—Fay Roberts Oil Co.'s Russell 1, 25-12-29, lcn.

LOGAN COUNTY—M. W. Greesom's Parks 1, 21-8-24, sd 1309 ft. J. H. Flowers' White 1, 13-5-26, sd 3610 ft.

MILLER COUNTY — W. E. Noel et al's Dickson 1, 11-20-27, sd 1955 ft. Fitzwater et al's E. L. Beck 1, sw se 33-15-26, sd 2220 ft.

OUACHITA COUNTY—W. H. Copenhaver et al's Berg 1, se se 13-15-17, sd 2011 ft.

PIKE COUNTY—Kentucky-Ark. O&G Co., Inc.'s, Tilyou 1, 26-8-24, ta 2920 ft; East 1, 13-9-23, 10-inch 288 ft, sd 1812 ft hd rock, acct high water.

PRAIRIE COUNTY — Powell Creek O&G Co.'s Kloss 1, ne nw 3-4n-6w, partly rigged up and sd.

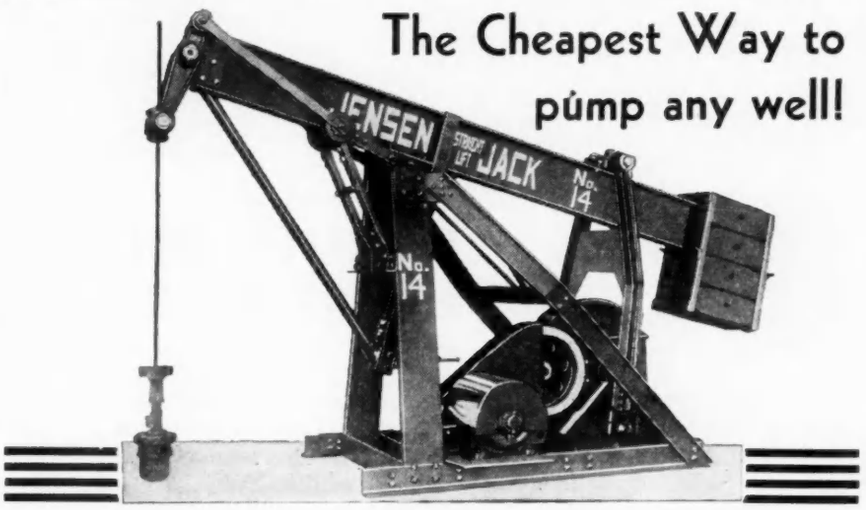
SCOTT COUNTY — Heavener O&G Co.'s Reser 1, 36-4-26, sd 1436 ft. Waldron O&G Co.'s J. G. White 1, 17-3n-29w, sd 1860 ft, (second hole).

SEBASTIAN COUNTY—M. W. Greesom's Spears 1, 9-7-29w, sd 1536 ft.

SEVIER COUNTY—Tri-State O&G Co.'s Bank of DeQueen 1, 34-8s-32w, sd 950 ft.

ST. FRANCIS COUNTY—Walmer Oil Co.'s White 1, sw nw 1-4n-2e, rig.

UNION COUNTY — Southern Prod. Co.'s



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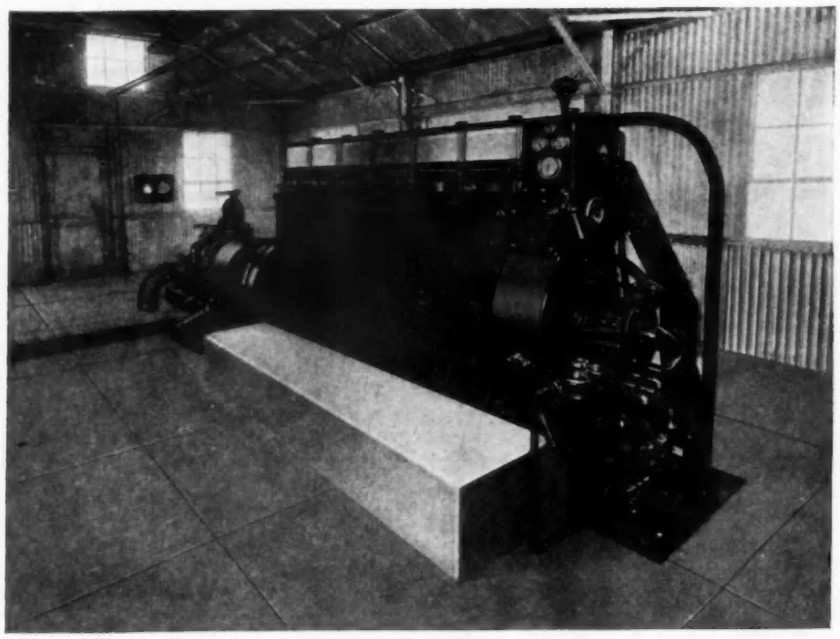


LOW-COST INSTALLATION— READILY PORTABLE

WITH dependability assured, portability becomes the paramount requisite for any prime mover in the oil fields. To be of value, this feature must also include a design capable of installation at low cost and with alacrity. On this basis, the De La Vergne Diesel, illustrated above, was purchased by one of the large oil companies. This engine is a part of a unit installed in a mid-continent pumping station for pumping oil in a gathering line.

The engine is a six cylinder, four cycle, solid injection, type "VH" De La Vergne Diesel of 300 b. hp. As a part of the Diesel-Centrifugal Oil Pumping Unit, it operates at 750 r. p. m. and through increaser gears drives the 3600 r. p. m. centrifugal pump.

The approximate weight of the entire unit is 21,500 lbs., of which over 10,000 lbs. comprise the weight of the pump, gears and cast-iron base. It is evident that this low weight together with its high speed makes these engines particularly well adapted for such work, where ease of transportation and quick and low-cost installation are essential.

Further information on De La Vergne high speed, low-weight Diesels sent on request. Write today.

DE LA VERGNE ENGINE CO.

SALES AGENT FOR BALDWIN-SOUTHWARK CORP.

DIESEL DIVISION

PHILADELPHIA, PA.

Wingfield 1, 16-19-15, repr rig and arr res, td 2608 ft. Lion O. R. Co. et al's Huy P. Hayes A-9, ne ne Section 4-16-15, elev 96 ft, arr res lub to recov hung ds, td 7255 ft salt. Drillers Oil & Dev. Co.'s Pickering 1, 1-17-16, ta 2166 ft; Haney 1, nw se 1-17-16, rig. Modisette et al's Union Sawmill 1, sw nw 13-18-13, 10-inch 167 ft, top sand 2266 ft, tested sw slight oil show 2266-80 ft, sd 2280 ft. Hill et al's Barnes 1, ne ne 21-19-15, dk.

WASHINGTON COUNTY—C. H. Willoughby's Jones 1, 34-16-30, sd 2150 ft.

YELL COUNTY—T. Luckett's Balcon 1, 36-7-12, ta 5640 ft.

MISSISSIPPI

Company, Well and Location—	Initial Production Bbls	Depth
MONROE COUNTY—		
Amory Dev. Co., Bourland 1, 2-15-19	*	3007

CHICKASAW COUNTY — Hightower & Golson's Fleming 1, 20-13-3e, ta 1640 ft.

HINDS COUNTY (Edwards Dist.)—Miss. Minn. Oil Co.'s Edwards Land Co. 1, sw ne 23-6n-4w, 12& cas 110 ft dr 600 ft green shale.

JESPER COUNTY (Bay Springs Dist.)—Bay Springs Pet. Inc.'s, J. H. Keyes 1, nw ne 21-2n-10e, ta 3408 ft, Wilcox.

LAMAR COUNTY (Purvis Dist.)—Stauffer & Kouri, Trs.' Bond 1, se ne 18-2n-14w, sp.

LOWNDES COUNTY — Lowndes County O&G Co.'s Carr Est. 1, ne nw 34-17n-16e, rig.

MONROE COUNTY (Amory Dist.)—Amory Dev. Co.'s Bourland 1, 2-15-19, dry abn, td 3007 ft, brown sand. P. J. McAlpine's Cowart 1, 2-12s-19w, ta 3793 ft, brown sandy lime.

NEWTON COUNTY (Newton Dist.)—Dalton Dev. Co.'s Majure 1, se se 25-6n-11e, 10-in 295 ft, dk down, sd 1420 ft.

NOXUBEE COUNTY (Macon Dist.)—Thompson O&G Synd.'s Donahue 1, se ne 25-16n-17e, elev 280 ft, sd 1735 ft; Ames 1, nw nw 24-16-18e, dk pat.

RANKIN COUNTY (Jackson Dist.)—Atkisson & Dyer's Valentour 1, nw nw 18-5-2e, elev 270 ft, co to run cas, td 2428 ft. Majestic O&G Co.'s Elton Lbr. Co. 1, 10-4n-3e, dk.

SCOTT COUNTY—Culley et al's Owen 1, 2-8n-9e, dk.

SHARKEY COUNTY (Nitta Yuma Dist.)—United Gas Pub. Serv. Co.'s Lenhart 1, sw se 14-14n-6w, elev 100.6 ft, cemtd 10-inch 975 ft, dr plug.

STONE COUNTY—Hercules Sulphur Expl. Synd.'s Lang 2, sw sw 28-3s-11w, sd 1754 ft, hd lime.

WARREN COUNTY (Vicksburg Dist.)—Eagle Lake O&G Co.'s Kiger 1, sw ne 9-18-2e, sd 2607 ft.

WEBSTER COUNTY — P. J. McAlpine's Henley 1, se nw 15-21-11e, cored gravel, sd 1800 ft.

ALABAMA

MADISON COUNTY — Tennessee Valley O&G Co.'s Fee 4, 1-4s-2e, no report.

SUMTER COUNTY (Livingston Dist.)—Forked Lightning O&G Co.'s Nixon 1, 30-20-2w, dk.

WASHINGTON COUNTY—Hobson et al's Hobson Bros. 1, 9-8-2w, ta 1450 ft. Oscar Brown's U. S. Land & Cotton 2, 23-3-2w, ta 700 ft.

TENNESSEE

CHESTER COUNTY—Gilmore et al's Scott 1, 10-inch 522 ft, dr 885 ft, Selma clay.

DECATUR COUNTY—Chester County O&G Co.'s Montgomery 1, arr res, td 2511 ft.

FLORIDA

DADE COUNTY—East Coast Oil & Nat. Gas Co.'s Warick 1, 12-55s-40e, sd 5305 ft. Miami, Fla., Oil Co.'s Chevalier Corp. 1, nw nw 19-54s-35e, elev 9 ft, arr reland 6-inch, td 4600 ft.

LEVY COUNTY — Suwanee Pet. Corp.'s Sholtz 1, nw se 9-15s-13e, elev 34 ft, sd 4010 ft.

MANATEE COUNTY—Surprise Oil Co.'s Palmetto 1, 13-34s-17e, sd 852 ft.

PINELLAS COUNTY—Pioneer Oil & Mining Co.'s Yerxa et al 1, 2-29s-16e, co, td 1151 ft.

WALTON COUNTY—Calumet Co.'s Walton L. & T. Co. 1, se ne 7-1n-17w, dk pat. Oil City Corp.'s Walton L&T Co. 1, ne nw 12-1n-19w, cor hd Eutaw sandstone 4440 ft.

New Equipment for the Field

MACHINERY - TOOLS CATALOGS - BOOKS

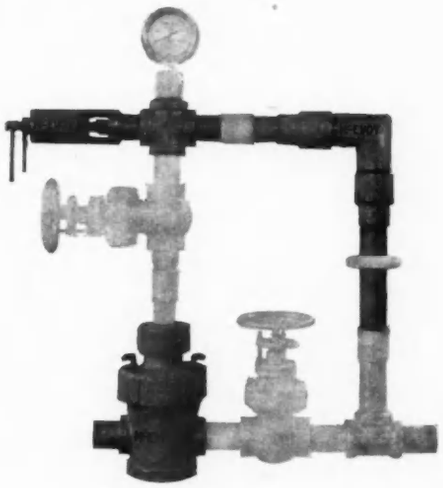
▼ ▼ ▼

1. Well Hook-Up

J. H. McEVOY & COMPANY

J. H. McEvoy & Company, 600 Milby Street, Houston, announces production on a new type of well hook-up, especially designed to meet conditions existing in East Texas.

McEvoy products furnished for the new hook-up include the standard McEvoy casing heads; a new type adjustable choke which has a full opening when withdrawn; and an adjustable Universal ell which allows for adjustment of the length of the tree for ease in installation. The new hook-up allows the operator to interchange any type of valve.



McEvoy Well Hook-up

The adjustable ell facilitates installation of the Christmas tree, and the elimination of strain due to poor fittings and alignment by the men in the field. A side for allowing the use of any type of valve it offers sufficient adjustment to allow for the use of standard ready cut nipples and fittings. It further is designed to permit the use of any of the McEvoy types of casing heads. The adjustment of the ell as now designed is a total of three inches, allowing the use of standard nipples which run in increments of two-inch lengths.

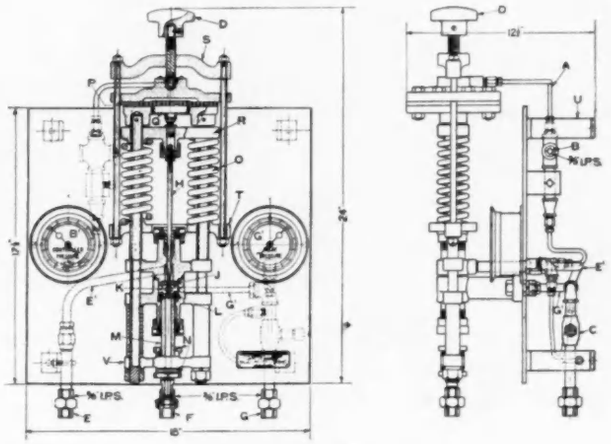
With this type of hook-up the well may either be washed in or swabbed in.

2. Relay Pressure Valve

BAILEY METER COMPANY

Bailey Meter Company, 1050 Ivanhoe Road, Cleveland, Ohio, announces a relay pressure valve known as the Style G, which is designed to give extremely accurate pressure control of steam, water or gas lines.

The relay valve controls the pressure within close limits by regulating the movement of a sylphon operated or piston operated throttle valve installed in the line in which the pressure is to be controlled. A minute change in the controlled pressure



Bailey Relay Pressure Valve

will result in a relatively large change in the motive pressure used to operate the regulating valve, according to the manufacturer.

The controlled pressure is connected to point "B" and serves to actuate the diaphragm "P" against the force of springs "O." A motive pressure of air, water or steam at 50 pounds per square inch or over is connected to line "F." Line "G" connects to the sylphon or piston operated regulating valve, and line "E" serves as an exhaust. The pressure which exists in line "G" depends upon the position of the diamond valve "K" between the port "L" through which the motive pressure enters and the seat "J" through which the motive pressure exhausts. Assuming that the pressure "B" increases above that for which the relay valve is set, the diamond valve "K" would be moved closer to the seat "L" by the movement of diaphragm "P." This throttles the flow through seat "L" and at the same time increases the port area through seat "J," with a consequent decrease in pressure in line "G," with would in turn cause the main regulating valve to close slightly and bring the control pressure back to normal.

Handle "D" is used to balance the force of springs "O" against the controlled pressure "B" which is indicated on the pressure gage at the left. The relay pressure is indicated by the pressure gage at the right.

Due to a feature enabling change of the seat gap by ad-

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THE OIL WEEKLY,
Houston, Texas, U. S. A.

Please see that I am supplied, without obligation, additional information on New Equipment Items Nos._____ described in the March 18, 1932, issue of THE OIL WEEKLY.

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Company .....

Address .....

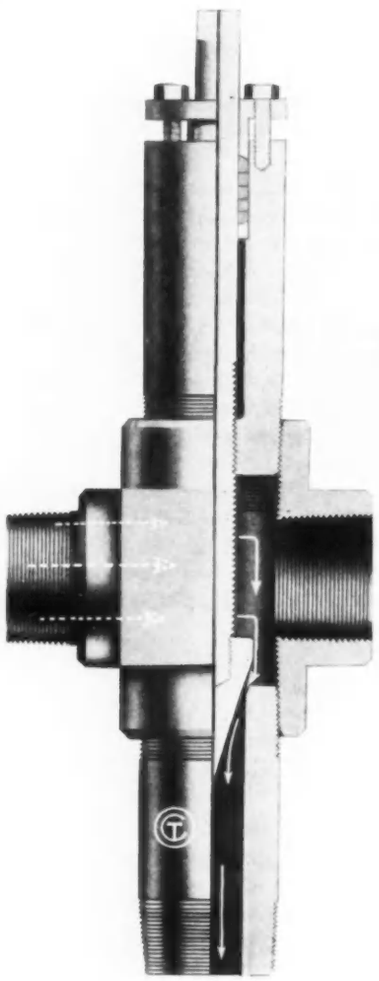
justment of micrometer adjusting nuts "M" and "N," it is possible to obtain any desired speed or lag in amplified pressure connection "G," the manufacturer states.

3. Needle Valve Assembly

OIL CENTER TOOL COMPANY

Oil Center Tool Company, 924 Adele Street, Houston, announces full production on the new OCT Type B needle valve choke assembly, designed in such a manner that the well may be swabbed through it.

The swabbing job is accomplished by disconnecting and removing the needle valve stem guide and needle valve and swabbing through the body of the assembly. When the well starts to clean itself, the gate valve is closed, the needle valve and stem guide are re-connected and a bull plug is screwed into the top opening of the assembly body. The needle valve is then opened, and the well allowed to clean itself.



OCT Type B

The Type B choke assembly also has a renewable valve seat, and a renewable needle nose. To renew the seat it is necessary to close the gate valve and disconnect the flow line. The nose of the needle valve is easily replaced by removing the valve stem and connecting a new nose.

Catalogs • Bulletins

Cement

Dewey Portland Cement Company, Farifax Building, Kansas City, Missouri, has released a bulletin dealing with the application of a new, quick-hardening cement, tradenamed "Dewey Super Cement."

Wire Rope

Hazard Wire Rope Company, Wilkes-Barre, Pennsylvania, has published a very interesting illustrated booklet titled "Twelve Reasons Why You Save Money With Lay-Set; *Pre*formed Wire Rope."

Guiberson Pump

The Guiberson Corporation, Box 1106, Dallas, Texas, has available for distribution index sheets Form 123 Revised and Form 123-A, covering specifications and price of the Guiberson booster pump.

Regulators

The Mercon Regulator Company, 1 LaSalle Street, Chicago, Illinois, has issued for distribution during 1932 Catalog No. 5, covering its complete line of pressure and flow regulators and containing a description of its new adjustable port features and of its new liquid level controllers.

A. A. P. G. Bulletin

The American Association of Petroleum Geologists, Tulsa, Oklahoma, has recently published Volume 16, Number 2, of the Bulletin of the American Association of Geologists for February 1932.

The bulletin contains the following papers: "Lower Permian Correlations in Cleveland, McClain, and Garvin Counties, Oklahoma," by Robert H. Dott; "Lower Pliocene in Santa Maria District, California," by William W. Porter, II; "Michigan Structural Basin and Its Relationship to Surrounding Areas," by George W. Pirtle; "Geology of Muskegon Oil Field, Muskegon, Michigan," by R. B. Newcombe; "Asymmetric Folds, With Special Reference to German Salt Bodies," by Hans Stille; "Bryson Oil Field, Jack County, Texas," by J. P. Bowen and James F. Gibbs; "Structural and Stratigraphic Development of South Permian Basin, West Texas," by R. L. Cannon and Joe Cannon.

In addition to the above papers there are geological

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Please send me, without obligation, free booklet described in THE OIL WEEKLY, *March* 18, 1932.

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notes on the following subjects: "Southward Extension of Bonham Clay, Texas," by C. I. Alexander and J. P. Smith; "Gideon Oil Well No. 3, Luling Field, Caldwell County, Texas," by E. W. Brucks; "Overturned Plunge on Overturned Folds in Sespe-Piru Creek District, California," by C. E. Leach and F. A. Menken; "Pecan Gap Chalk: New Localities in Red River and Bowie Counties, Texas," by H. N. Spofford, and "Earth Cracks in Mississippi," by Watson H. Monroe.

The February issue of the bulletin also carries the regular departments such as Reivews and New Publications, The Association Roundtable, and Personal Items of the Profession.

Screen Removed from Blue Ridge Well by Cutting in 64 Pieces

The accompanying picture tells the story better than words of the difficult cutting job performed by Hall & Lowery Iron Works, Incorported, Goose Creek, Texas, in order to work over Coronado Oil Company's Blakely 2 at Blue Ridge for a second initial production greater than the first.

Blakely 2 originally was completed at 4397 feet for an initial production of 480 barrels of 25.1 gravity oil, coming from a sand in which about 35 feet of .008 Layne & Bowler, 4½-inch screen was set. Casing, 6⅝-inch, had been set at 4357 feet.

Producing conditions of the well became such that it was necessary to deepen in February. The first step was to remove the liner, screen and back-pressure valve, an operation which could only be performed by cutting the material out.

Fifty-eight pieces of 4½-inch liner and screen recovered in 38 round trips on Coronado Oil Company's Blakeley 2, Blue Ridge field. Standing, from left to right, are Jim Buckles, Hall and Lowrey, operators; Walter Baker, helper; Sam Hardage, driller. Front row, left, R. J. Forrest, helper; right, T. J. Lee, helper.

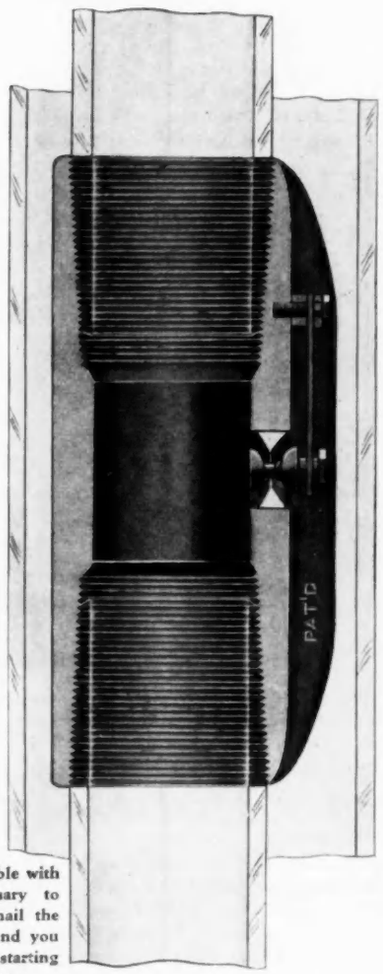
Sixty-four cuts were made to obtain the 35 feet of screen, or an average recovery of about six inches per cut. Some of the cuts were less than one inch, a meticulous necessity because of the crookedness of the hole.

In all, 158 feet of screen and liner, in addition to the back-pressure valve, were recovered. Three cuts were made in recovering the liner. In recovering all this material, only 38 round trips were made.

After completion of the cutting job, Blakely 2 was drilled on down to 4500 feet, where she was brought in for 1500 barrels of 29.1 gravity oil.

STOP HIGH PRESSURE TROUBLES

The NEW Type P & T Kick Off Unit, has been designed to give full and unrestricted passage to any tool which will pass through the tubing. To start deep wells with **low pressures** install the NEW P and T KICK-Off Units.



Cut shows valve in neutral position

Working pressure is all that is needed to flow a well.

If you are having trouble with high pressures necessary to *kick off* deep wells, mail the coupon and we will send you full information on starting wells with low pressures.

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NEWS *from the* *Industry's* EQUIPMENT MAKERS

Keeping in touch with developments with Manufacturers and Supply Dealers

Kasishke Enlarges Equipment Business

With the acquisition of the oil equipment manufacturing business of J. A. Werme Steel & Iron Works in Oklahoma City, A. H. Kasishke, president of A. H. Kasishke, Inc., has enlarged his activities in the oil industry and established main offices in the Exchange Bank building in Tulsa. Credited with building the first steel derrick in the state, Mr. Kasishke formerly

A. H. KASISHKE

was head of the A. H. Kasishke Rig & Lumber Company with branches at Maud, Asher, Sasakwa and Konawa and during the development of the Seminole field built upwards of 500 derricks in that area. During the Oklahoma City development he built 200 derricks there and has been actively identified with the industry for more than 20 years.

Manufacturing facilities of J. A. Werme Steel & Iron Works in Oklahoma City afford A. H. Kasishke, Inc., ample equipment for building steel derricks, walking beams, rig irons, steel fronts, and also to handle contract jobs complete. One of his new products just announced is a combination rotary and cable derrick 122-foot size, with silicon steel legs. Other sizes are to be announced shortly.

Prior to this enlargement program, the main offices of the company have been located at Oklahoma City and manufacturing and sales offices will continue to be maintained at 510 No. Indiana Avenue there, with field offices at 243 Southeast Grand Boulevard.

R. B. George Machinery Company, Dallas, dealers for Caterpillar tractors, has opened a branch at Longview, Texas, under management of D. M. McClure, secretary of the company.

Fred E. Cooper of Tulsa, oil field representative of the tractor division of Allis-Chalmers Manufacturing Company, has moved headquarters from 18 South Madison Street to 211 South Lansing Avenue, quadrupling his floor space to take care of additional stock resulting from the merger of the above manufacturer with Advance-Rumely Company.

Caterpillar Tractor Company, Peoria, Illinois, announces appointment of the following new dealers: Jack Neal Sales Company, San Antonio; Rio Grande Hardware and Machinery Company, Harlingen, Texas; and Jarvis-Tull Company, Plainview, Texas.

Guthrie Goes With Atlas Sales Corporation

Roy R. Guthrie, recently appointed general manager of Atlas Sales Corporation, Foreman Building, Los Angeles, has risen from the ranks to his present position. He was born in Pennsylvania, came to Southern California in 1912. His first step up was his promotion from roustabout to a drilling crew with Western Union Oil Company, now the Shell Oil Company of California. Shortly after that he was a driller for Getty Oil Company. About this time the United States entered the World War and Mr. Guthrie joined the navy. After serving two years he returned to California where he took up drilling again.

The after-war depression almost totally suspended drilling operations and Mr. Guthrie became associated with Stoody Company as salesman. Mr. Guthrie later accepted a position as salesman with the H. C. Smith Company, manufacturers of oil tools, becoming shortly thereafter sales manager. In the five years he was with H. C. Smith Company, the business assumed an international character.

ROY R. GUTHRIE

His record with the Smith organization was such that he was offered the position of general sales manager by Universal Engineering Company. This latter concern was manufacturing a drilling bit of unusual design which, although possessing many advantages, called for considerable education on the part of drillers before it was successfully marketed. Upon Mr. Guthrie's assuming direction of the sales effort, remarkable advances were made and in 1929 more than one million dollars worth of the Universal's drilling bits were sold in the oil fields of Southern California. In recognition of this record Mr. Guthrie was made a director of the company.

In 1931 Mr. Guthrie organized his own company under the name of Whittier Sales Corporation. Despite depressed conditions this new corporation, dealing in oil field specialties and supplies, made good progress. His record in building that business under present conditions attracted the attention of the Atlas Sales Corporation to him and led to his accepting a proposal that he dispose of his interest in the Whittier Sales Corporation and assume the Atlas management.

Atlas Sales Corporation conducts an extensive business in insurance and brokerage, as well as being agents for and manufacturers of lines of oil well supplies.

A. M. Lockett and Company, Ltd., New Orleans, Louisiana, has been appointed Southwestern representative in sales and service for the Babcock and Wilcox Company and also the Babcock and Wilcox Tube Company.

Offices of the Lockett Company are maintained at Houston and Dallas, in Texas, and a new district office has been opened in Tulsa at 507 Philtower building, in charge of F. P. Elizardi. The Tulsa office is under supervision of the Dallas branch.

Correction

Through an unfortunate error on the part of a Chicago photographer, the wrong photograph was sent THE OIL WEEKLY for publication in connection with the recent obituary notice of Richard Stresau, A. O. Smith Corporation. The photograph which was published was that of another Mr. Stresau.

Squeaks from the Bull Wheel

▼ ▼ ▼

Archibald Percival Reginald Earl decided one evening to call on his girl.

Together they talked of their "kith and their kin."

He said, "May I kith you?" and she said, "You kin."

Young Wife—"Oh, I'm so miserable. My husband has been out all the evening, and I haven't the faintest idea where he is."

Experienced Friend—"My dear, you mustn't worry. You'd probably be twice as miserable if you did know."

"Doesn't the hero ride beautifully? Just as though he were part of the horse,"

"Which part?"

Hubby—Don't let the baby put that quarter in his mouth, there are germs on it.

Wifie—Nonsense! Germs could not live on the money you make.

"Gerald, dear, why were some women called Amazons?"

"Well, my dear, you remember the Amazon River has the largest mouth—"

But she went out and slammed the door before he could say any more.

"So you were in the hospital three months! Must have been pretty sick!"

"No, pretty nurse,"

Judge—What is the charge, officer?

Officer—Driving while in a state of extreme infatuation.

A man who had just opened a store in a strange town was interrogating one of his early customers on the purchasing power of the citizens.

"Now, there's Deacon Brown," he said. "He has the reputation of being wealthy. Would he be likely to spend much money in here?"

"Wa'al," drawled the native reflectively, "I wouldn't exactly say he'd go to hell for a nickel, but he'd fish around for one until he fell in."

Young Daughter: "What is alimony, mother?"

Mother: "It's a man's cash surrender value, my dear."

Drunk—Where am I?

Passerby—On the corner of State and Madison.

Drunk—Never mind the details. What town is it?

"I hear you dropped some money on the Stock Exchange. What were you, a bull or a bear?"

"Neither. Just a simple ass."

Hotelkeeper: I have rooms for fifty and seventy-five cents a night.

Guest: What's the difference between them?

Hotelkeeper: Not much, only the seventy-five cent ones have rat-traps.

These jail birds are tough nowadays. One who was about to be executed was told that he could have an hour of grace.

"OK, boss, bring her in," was the nonchalant reply.

In the smoking room of the big hotel the Scot had been boring everyone with tales of the great deeds he had done.

"Well, now," said an Englishman at last, "suppose you tell us something you can't do, and, by jove, I'll undertake to do it myself."

"Thank ye," replied the Scot. I canna pay ma bill here."

He was telling her about the members of his baseball team.

"Now, there's Harris," he said; "in a few weeks he'll be our best man."

"Oh, this is so sudden," said she, thereby establishing the record for the world's champion conclusion jumper.

"I hear you lent Peterson $10. What surety have you?"

"I am sure I shall never get the money back."

Lady (former telephone operator, to Pullman porter who had failed to call her as directed)—Porter, why didn't you call me at 7:30?

Porter—Ah did, ma'am. Ah said, "seben-thirty," and you-all said de line was busy, and when Ah pusisted you-all said, "So's your old man. Git off de line, or I'll knock you fer a gool." So Ah did.

A negro woman walked into an insurance office and asked whether they dealt in fire insurance.

"We do," a clerk replied. "What do you want insured?"

"Mah husband."

"Then you don't want fire insurance," smiled the clerk, as he reached for another application form. "What you want is a life insurance policy."

"No, Ah don't," exclaimed the woman. "Ah wants fire insurance. Mah husband's been fired fo'times in de las' two weeks."

Guide and Float Your Strings Safely with Baker Cement Equipment

Driving a car without brakes is all right until you want to stop—and then it's tough.

Running a string of casing without a guide and a float for protection and safety is all right, too—until something goes haywire—and then it's just too bad.

As a matter of fact, it's much cheaper in the end to protect your strings than to neglect this precaution. One string of casing turned into a corkscrew will pay for a lot of Baker Cement Equipment.

The Baker Cement Float Shoe, here illustrated, offers you, in one unit, an exceptionally efficient, strong guide and a float with a safety factor so far in excess of the usual safety factor of 2½ or 3 that there is never any need to consider it as a possible source of trouble.

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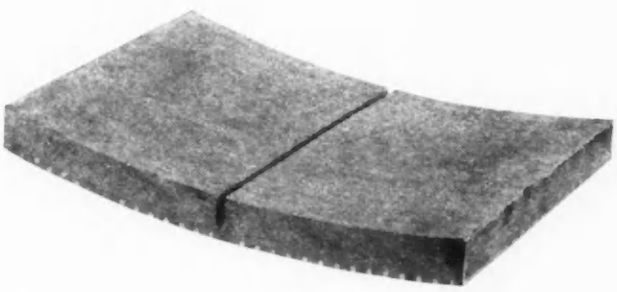
AMERICAN BRAKEBLOK SHARES IN ANOTHER

world's record



The following news bulletin tells a powerful story of the economy and satisfaction delivered by American Brakeblok in oil-well drilling:

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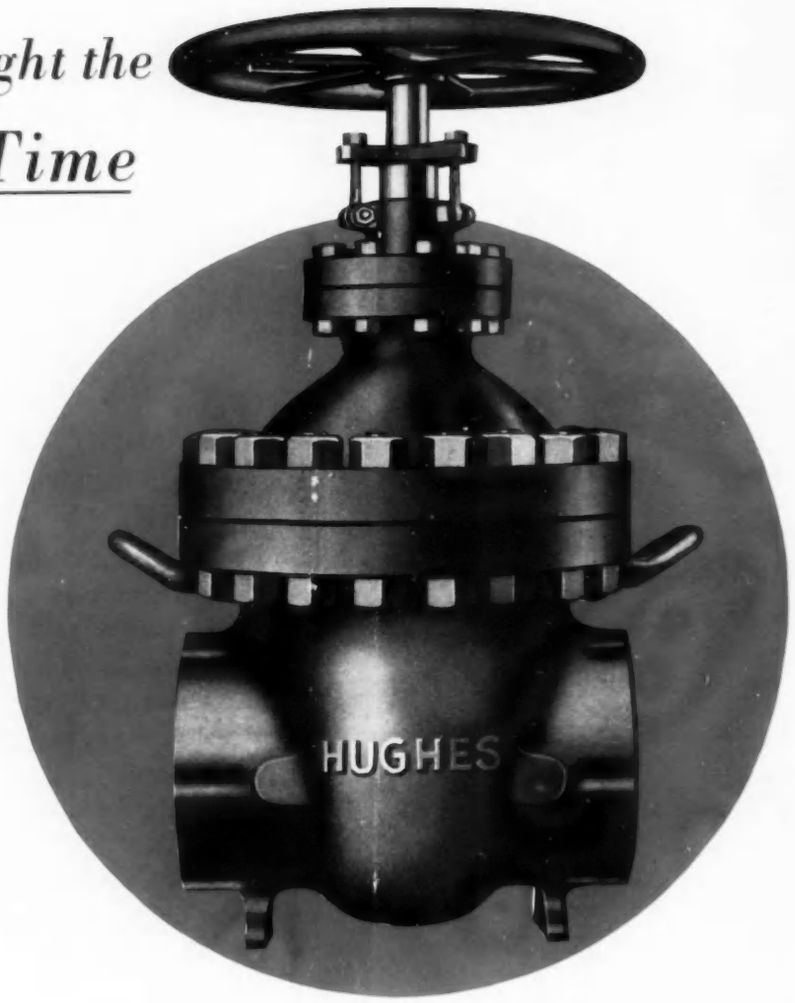

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